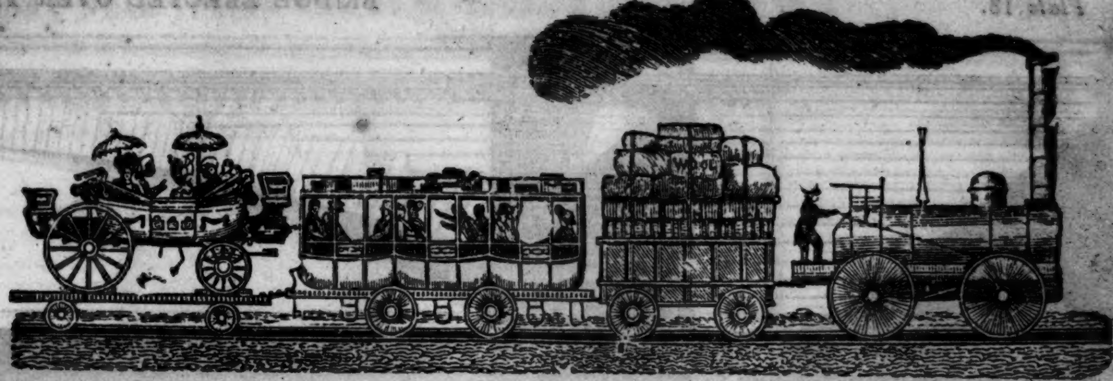

AMERICAN RAILROAD JOURNAL,

AND ADVOCATE OF INTERNAL IMPROVEMENTS.

PUBLISHED WEEKLY, AT NO. 30 WALL STREET, NEW-YORK, AT FIVE DOLLARS PER ANNUM, PAYABLE IN ADVANCE

D. K. MINOR, and GEORGE C. SCHAEFFER, } EDITORS AND PROPRIETORS.]   SATURDAY, JULY 1, 1837.   VOLUME VI.—No. 26.

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AMERICAN RAILROAD JOURNAL.

NEW-YORK, JULY 1, 1837.

HIWASSE RAILROAD.—The following extract from a letter, dated Athens, Tenn., June 15th, furnishes renewed evidence of the spirit with which the people of the south and west, prosecute their works of Internal Improvement—we need not say how much pleasure such notices afford us, nor how deeply we regret the delay which is caused by the present depression of business, upon our own great works. The times *must mend*, and the works *must proceed*.

The 40 miles of the Hiwassee Railroad, extending from the Tennessee River to the Hiwassee at Calhoun, have been let out to good responsible contractors, at prices which ensure their completion, at a cost less than my estimate. The surveys have been extended to near Knoxville, a further distance of 30 miles, with a result equally as favorable as the portion let out.

☞ The *re-publication* of the "Transaction of the Institution of Civil Engineers," has caused delay in noticing several Railroad reports which have been received at different times. We shall endeavor to give them attention soon.

To the Editors of the Railroad Journal.

We give place to the following communication, in relation to "Aldrich's Locomotive for ascending inclined planes," without stationary power, to prevent any misapprehension from the imperfect notice of it in a recent number.

On my return to the city a few days since, I observed in your Magazine of June 8th, a notice of my model, or mode of ascending and descending inclined planes upon Railroads, with a Locomotive Engine. I had come to the conclusion to say no more about my improvements (in the manner of gazetting) until they were thoroughly tested upon a large scale. But as you have been kind enough to notice a model of mine, which is at the American Institute, which is a very imperfect one, it may have a bad, instead of a good effect. The model which you saw, does not by any means contain all my improvements; the bar in the centre of the axle of the driving wheels which you supposed to be for the purpose of regulating the velocity in descending, is no part of my improvements, it was placed there for the purpose of ascertaining the power requisite to overcome the gravity of loads upon different angles of inclination, running upon different sized wheels, the lever to which the power was applied, remaining the same on all the elevations. It is unnecessary for me at the present time, to go into a regular specification of my improvements, but I will merely state what they are intended to obviate, and what to overcome, in the present mode of constructing Railroads, it is intended in all cases to do away with stationary power, and in some cases to run up an inclination instead of running around.

It would in many cases, require more power and time to overcome the extra friction on the length of the curvature around an elevation, than it would to overcome the gravity upon the inclination, many have examined my late models, and think they will succeed, but the only way to settle such matters is, to test them upon a large scale, or put them into actual use, which I am in hopes soon to accomplish.

Respectfully,
your ob't. serv't.,
E. F. ALDRICH.

STATE IMPROVEMENTS.—The Ravenna Star announces that Governor Vance has subscribed *four hundred and fifty thousand dollars* on behalf of the State, to the stock of the Pennsylvania and Ohio Canal Company. The money is to be borrowed on the credit of the State. The counties of Portage and Trumbull are expected to invest their surplus in a loan to the State for this purpose. The Bank of Muskingum has loaned $50,000 to the contractors on the canal at Zanesville, until the State can procure funds to continue that work.—[Scioto, Ohio Tribunal.]

Plate 13. BRIDGE ERECTED OVER THE

XXVI. DETAILS OF THE CONSTRUCTION OF A STONE BRIDGE ERECTED OVER THE DORA RIPARIA, NEAR TURIN, BY CHEVALIER MOSCA, ENGINEER AND ARCHITECT TO THE KING OF SARDINIA, &c. &c. DRAWN UP AND COMMUNICATED BY MR. B ALBANO, A. INST. C. E.

This bridge which may be characterized as the boldest work of the kind, is erected within the suburbs of Turin, over the Dora Riparia, a river ordinarily shallow, but liable to heavy floods, during which it becomes extremely rapid, owing to the great declivity of its bed.

It consists of a single large arch of granite, (of which the elevation is shown in Plate XIII.*) resting on solid abutments of the same materials; its line of direction is in continuation of the axis of the main road which crosses the Alps from France, called the road of Italy, and it has an unvarying surface level throughout its own length.

The foundation of the abutments are laid upon piles headed with cross sills, on which rest the first courses of stone with offsets: over these are placed five other horizontal courses, from the uppermost of which the arch springs, being a segment of a circle, having a span of 147.63836 feet, and a versed sine of 18.04468 feet. These proportions, which correspond to an arc of 54° 56′ 45″ 26‴, render it, I believe, the flattest arch of this form yet constructed in Europe.

The lightness of appearance derived from the flatness of the arch is much increased by the introduction of two *ugnature*, or cornes de vaches, (as the French call them,) which rising from the third course above the springs of the principal arch, form a second one of a somewhat larger span, (as represented in the Plate,) tangential to the first at the intrados of the key-stone, and having a versed sine of 12.1391 feet.

The sides of the abutments are of a convex form, and thus acting towards their bases as cut-waters, give, in conjunction with the ugnature, a more free and open passage for the descent of the stream in time of floods, whilst their upper parts add elegance to the wings of the structure and increase the width of the approaches: these last are bounded on each side by an advanced body of wall adorned at the salient angle by a pilaster, and terminating at the other end on the banks of the river, thus making the total length of the bridge between these extreme points 300 feet.

The arch is composed of 93 wedges, of which 91, including the key-stone, are of equal thickness,—as seen in Plates XIII. and Fig. 1, XV., whilst the remaining two at the springs are larger; their thickness being determined by the radius which meets the upper or apparent arch at the point where it springs from the convex part of the abutment. The key-stone is 4.9212 feet deep.

Upon the courses of the abutment from which the *ugnature* spring rest ten other horizontal courses, the upper surface of the last or superior one being level with the extrados of the key-stone, immediately surmounting which is a plain cornice with modillions cut in the solid stone, similar to those round the Temple of *Marte Vendicatore* at Rome,* (as seen in the cross section of the cornice, Fig. 4, XV.) This cornice is continued beyond the pilasters of the abutments in a plain band without modillions.

The upper line of the cornice marks externally the level of the footpath and centre of roadway; above this is a solid plain parapet rising perpendicularly from its base, and terminated by a corona; its total height being 3 feet 4 inches.

The roadway over the arch is 40 feet wide between the parapets: of this width each of the footpaths occupies about five feet, and the carriage-way 30 feet; but over the abutments the width is increased to 88 feet by their convex form, and at the approaches the roadway between the parapets of the advanced body of the walls is 144 feet wide forming at each end of the bridge a *piazzetta* or open ornamental approach.

The style of the architecture and the nature of the materials give to this bridge a noble and simple grandeur, and a character quite unique; and as a work of art it surpasses all structures formed on similar principles, and is far superior to the bridge of Rialto, built by Michael Angelo, which, though only having a span of 98.6 feet and 23 feet rise, was when erected and long after reckoned a masterpiece of work on account of its flatness.

If I may be allowed to express an opinion, the general architectural appearance of the bridge over the Dora would have been improved, if a simple projecting base had been given to each of the pilasters of the abutments, with its summit forming a line a little above the water level. By this addition a better proportion would have been maintained between the width and height of the pilasters, and a more strict accordance with the cornice that surmounts them. This method is now generally employed, with the best effect, in every great work of the kind, and particularly in this country, which possess some of the most magnificent structures of the same nature, particularly over the river Thames.

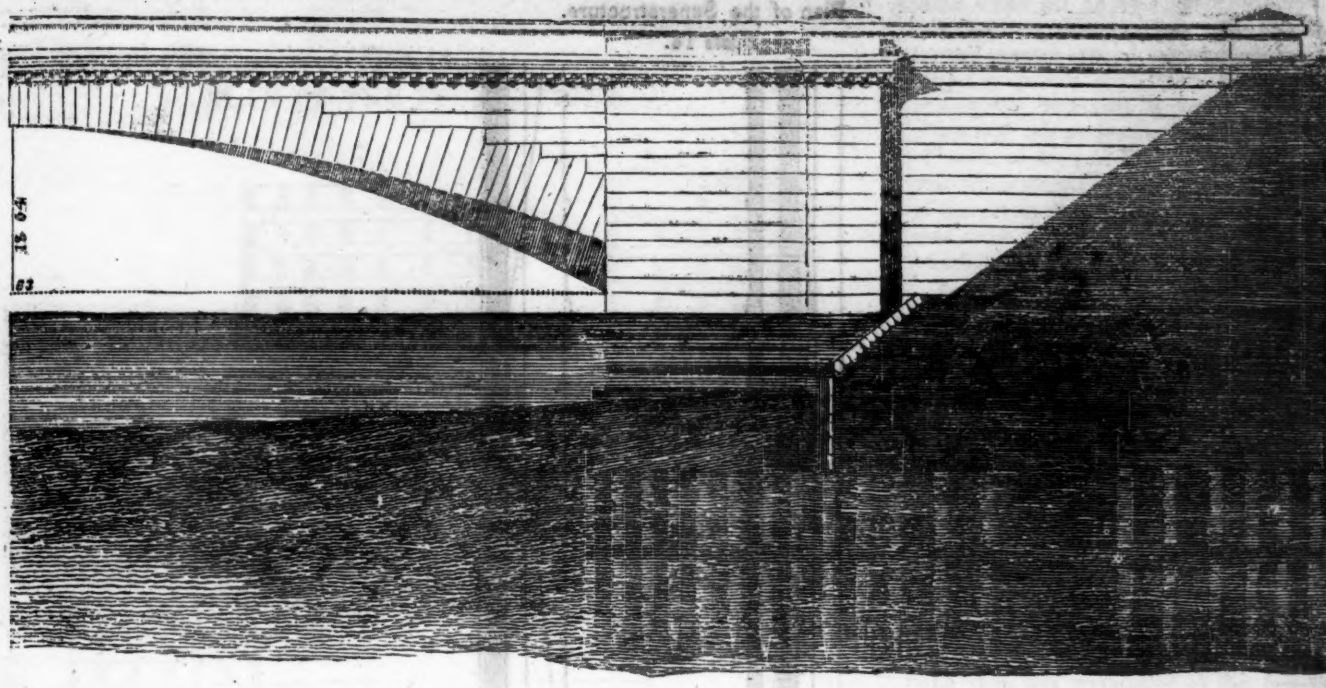
I shall now proceed to examine the particular reasons, which determined the engineer to propose and adopt such a structure, as well as to explain the accurate nature of the processes which he employed for the construction of a work, in which the boldness of the design is equalled, if not exceeded, by the excellence of the execution.

In planning the proposed bridge, the engineer had to keep in view the following points: 1st, That it was to be erected over a river of considerable width, and during floods, to which it was subject, of great velocity; 2d, That it was to correspond in its proportions with the main road over the Alps, one of the great thoroughfares into Italy; and 3dly, That it was to adorn the

* It will be observed that, in order to give the engravings of full size, we have been frequently obliged to give them in two parts, and on different, but contiguous pages.

* See Palladio, Book IV. Chap. VII. Ed. Lond. 1738.

DORA, NEAR TURIN. Plate 13.



approaches to a capital city of considerable magnitude and beauty.

The nature of the river and the oblique direction of its bed, relative to the axis of the main road at the entrance of the town, were the first difficulties to be surmounted, and the engineer at once conceived the necessity of making a new branch road through the suburbs, and of constructing the bridge of a single arch. He perceived the impediments and bad effects that an oblique bridge of three small arches would produce, having the piers also oblique to the stream, or even one of a single arch of larger span in a very oblique direction; he felt convinced too that the art, although not of recent origin in Italy*, does not afford to this day proper means of executing such a work satisfactory on a very large scale.

Nor could he adopt the plan of an arch perpendicular to the axis of the stream, without deviating from the straight line of the branch road which he has already projected from the centre of the town, which was designed to cross the suburbs, pass over the bridge, and continue on the opposite bank; nor without also being obliged to form such angles as would endanger the safety of travelling vehicles.

He conld not therefore adopt any other scheme than the one described, convinced, that where solidity, beauty, and convenience in a work of public utility are alike required no secondary consideration ought ever to influence any one who undertakes the direction of such a national enterprise, in which are involved the reputation both of the artist and his country.

The required section of the water way having been first established, an arch of the span above mentioned was resolved on, having its elevation restricted to that of the level of the main road. Every part of the structure was then projected on the soundest calculations of strength, and all the directions to be observed during the execution of the work were specified, so that it might be completed in the most accurate and satisfactory manner, and with the strictest economy both of time and money.

Preparatory to laying the foundations of the abutments on the shore, dams were constructed in front of their position, which being first drained by an artificial channel, the soil within them was excavated to 6.71 feet beneath low water mark, and the surface reduced to a perfect horizontal level: piles of oak, 12 inches thick, varying from 30 to 40 feet in length, and each furnished with an iron shoe of about 16 lbs., weight, were then placed from 3 to 4 feet from centre to centre, as shown in Plate XIV., and driven vertically through the strata, after which their heads were cut in a horizontal plane. These piles were driven by a rigging pile engine, having a monkey weighing 8 cwt., worked by 25 to 30 men, and thus 200 men were employed at the same time on each bank of the river. The depth of the foundations of each abutment is 40 feet, with a counterfort at the sides 20 feet by 10,—as shown in Plate XIV., and Fig Plate XV., taken at the level of the springing of the arch.

Piles were also driven in for the foundations of the circular parts of the abutments and of the advanced body of wall forming the approaches, in which a space of 18 feet diameter was left for the construction of an arch,—as shown in Plate XIV.

Sills of oak 12 inches by 10 were then laid down upon the piles in transverse and longitudinal directions, as shown in Plate XIV., and spiked down to them: all the spaces between the transverse sills were then filled with broken ballast immersed in moderately liquid cement of lime and ceroso*, in the proportion of about equal parts in weight: this mass filled all the interstices left between the sills, and rose to a level with their tops.

Upon this was then laid the first course of the foundation, consisting of granite blocks 1 foot nine inches in thickness, on which were continued three similar courses with two offsets of one foot, and over these were placed five other horizontal courses, each two feet high, constituting the face of the abutments, and the uppermost forming the resting points of the spring of the arch, lastly, seven other horizontal courses were superadded at the circular and rectangular portions of the sides.

At this stage the masonry work was stopped, and left to settle for a whole season, in order to take the consistency necessary for sustaining the lateral thrust of the intended arch.

In the meantime, for the purpose of ascertaining with great accuracy, the cut of the voussoirs, or arch stones, and the disposition of the timber forming the centres, and to facilitate the work in all its details, a platform of about 5,000 square feet was laid down, its surface being perfectly plane and level; and upon this was drawn the projected segment of the arch, together with that of another arch for the construction of the centres, of which the versed sine was 18.9015 feet. The arcs of these segments were drawn by means of points determined on the platform by dividing the respective chords into small equal parts, and finding the length of their corresponding ordinates by calculated tables. Thus was avoided the inaccuracy liable to arise from

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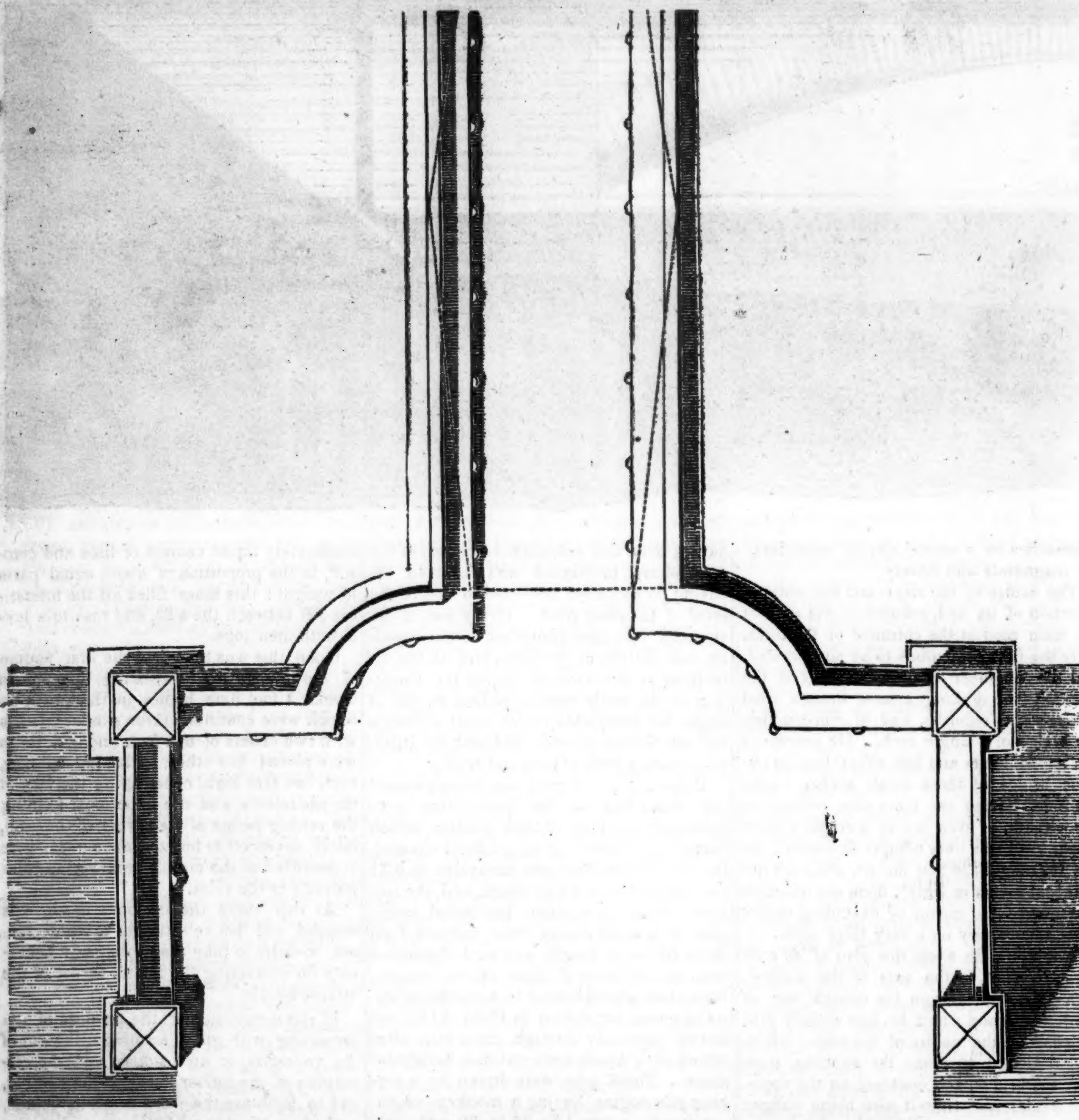
*The art appears to have been known there as early as 1530, when Nicolo, called "Il Tribolo," erected a bridge of this kind over the river Mugnone, near Porta Sangallo, at Florence, on the main road to Bologna. See Vasari, Vol. XI. p. 308, edizione di Milano, 1811.

* Ceroso is formed of tiles baked, pounded up in a mill, then passed through fine sieves, and just before using well mixed with lime in the proportion above mentioned.

PLAN OF THE BRIDG ERECTED OVER THE DORA.

Plan of the Superstructure.

Plate 14.



the very great length of the radius had they been described from a centre.

The centres of the two arches being determined, the disposition of the timber to be adopted for the centering was drawn on the platform in full size, and from these tracings all the timbers were prepared and shaped; the requisite operations for placing the different pieces forming a rib being facilitated by circular wooden rollers of equal diameter which, moving on the platform, sustained the timbers at a certain height above it.

When the timbers had been thus adjusted exactly over the lines drawn on the platform each was conveyed to its destined place, and fixed to its position by proper mortices and tenons; and while twenty carpenters were thus employed in constructing a rib, twelve others were putting up one already finished and requiring no farther alteration. Thus was completed in 45 days the whole workmanship and fixing of the centering, consisting of 10 equal ribs, each rib being composed of three courses of timber, bound at the joints by straps and keys of iron.

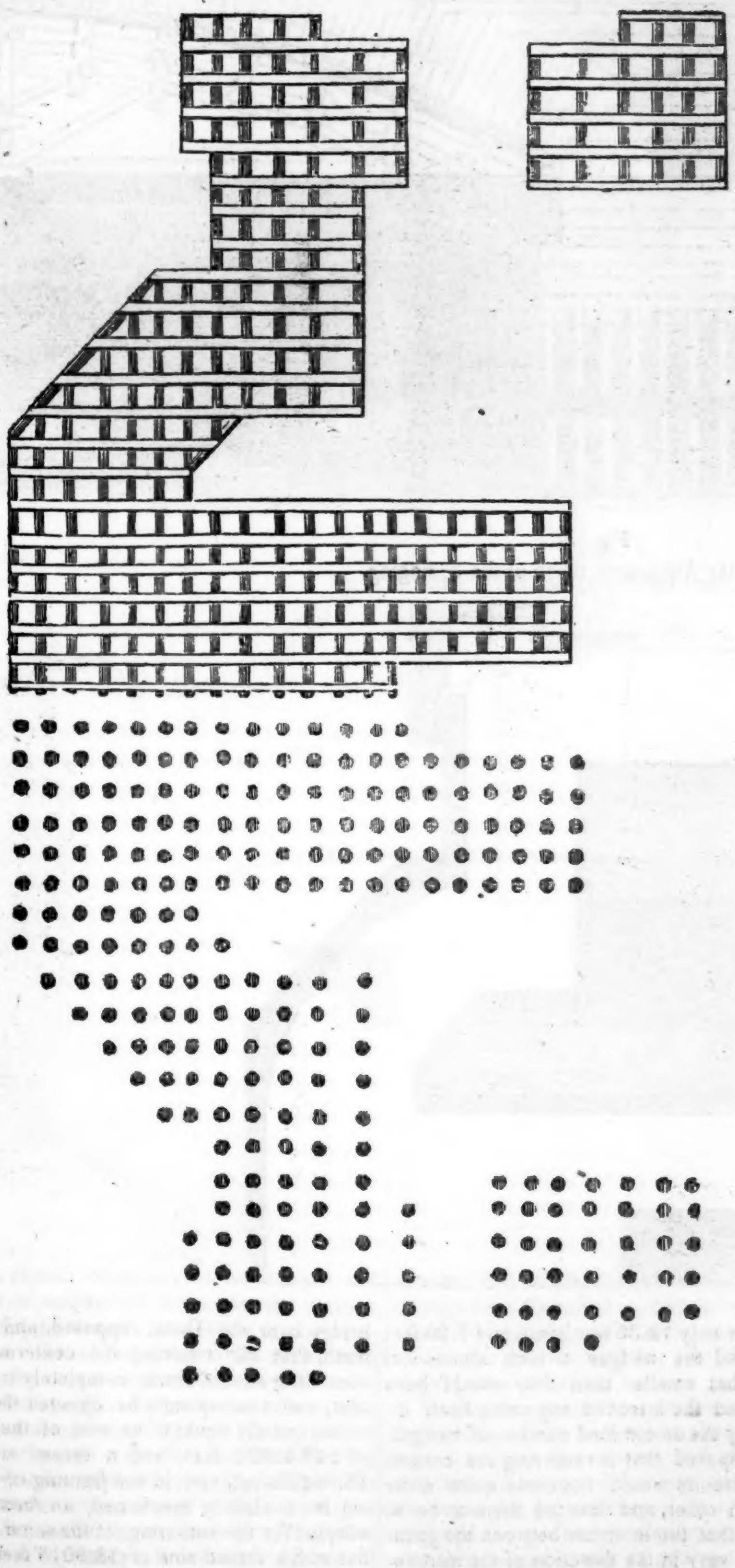
Two timbers were then placed upright close to the abutments, and three piles were driven into the ground in the middle of the river and crossed by three horizontal ties; the two upper ones supporting stays which strengthened the ribs. The ribs were bound together by twenty horizontal double timbers, fixed by proper plates, straps, and bolts; which with all other particulars will be best understood by reference to the first Figure of Plate XV.

Upon the platform was drawn also, by means of the tables before mentioned, the segment forming the exterior arch, and those horizontal courses of the abutments with which the voussoirs are connected; and in order to obtain the greatest precision in the cut of the wedges composing the two faces of the arch, which wedges harmonize angularly with the horizontal courses, and at the same time to verify their position on being placed, two tables were calculated, in one of which was noted,—first, the exact dimension of the principal arch;—secondly, the abscisses measured on its chord;—thirdly, the corresponding ordinates;—and fourthly, the tangents at the extrados of the keystone. The other table contained the same particulars calculated expressly for the face of the exterior or upper arch.

On the tracing of the arch drawn on the platform were constructed the wood models for cutting the stones, but as the wedges at the imposts and the intersections of the *ugnature* with the convex part of the abut-

Plate 14.

PLAN OF THE FOUNDATIONS.



ments were to form part of the horizontal courses of the abutments, the models for those could not so well be determined in this manner; these wedges were therefore formed upon a special model made for the purpose, upon a scale of 1 to 33⅓. In cutting the voussoirs a small temporary prism was left projecting on the lower face of each, as seen in Fig. 1, Plate XV., so that when placed in their position, the base of this prism was the only part of the stone that came in contact with the centering on which it rested.

In laying the body of the arch, the engineer deviated from the usual practice of setting up a service bridge or gangway upon the ribs composing the centering, but had small bridges constructed on each side and independent of it, though connected with each other. These bridges were of a width only sufficient to admit of the stones being moved along them, and the flooring of each being formed in two inclined planes tangents to the curve and meeting at the centre, the stones were dragged on rollers by means of capstans acting at the highest point of the service bridge, till each stone attained the level at which it was to be laid, and then was suspended by the following mechanism, and placed in its final position.

On the side next the centering of each of the service bridges, vertical timbers were erected at convenient distances, and supported by inclined props or stays, all the props on one service bridge being connected with the corresponding opposite ones on the other by strong horizontal beams that crossed the width of the bridge. Upon these last were laid longitudinal timbers, which served to sustain a moveable beam, that could be adjusted and fixed in a position to be over the place at which each wedge had to be ultimately laid. Pulley blocks were then attached to this beam so that they could run along it, and by means of ropes and a corresponding apparatus of punks, &c., the wedges were lifted up by a capstain situated behind each abutment.—With such a mechanical power acting from the extremity of the bridge, two masons only on the centres, assisted by a few workmen and laborers acting at the capstans, were able to place, in one day's work, about nine wedges, weighing upon an average 5 tons each, and the whole 651 wedges composing the arch, and weighing together 3250 tons, were placed in the space of 75 days. It should be observed, that the course of the keystone is formed of seven wedges, as seen in Fig. 2, Plate XV., the two outer ones being not less than 8 feet in thickness. Near one-third of the whole number of wedges weighed about 8 tons each, and those composing the first course at the springs, from 15 to 18 tons; and the whole of these enormous blocks were placed without the smallest accident to the workmen employed, or injury to the blocks themselves.

Theory shows, and it has been proved by trial on a small experimental arch, as well as by observation on the subsidence of arches of limited dimensions built by Perronet and other scientific men, that in this kind of structure the settling down takes

[Plate 15.

Fig. 1.

Half the Longitudinal Section and Centres.

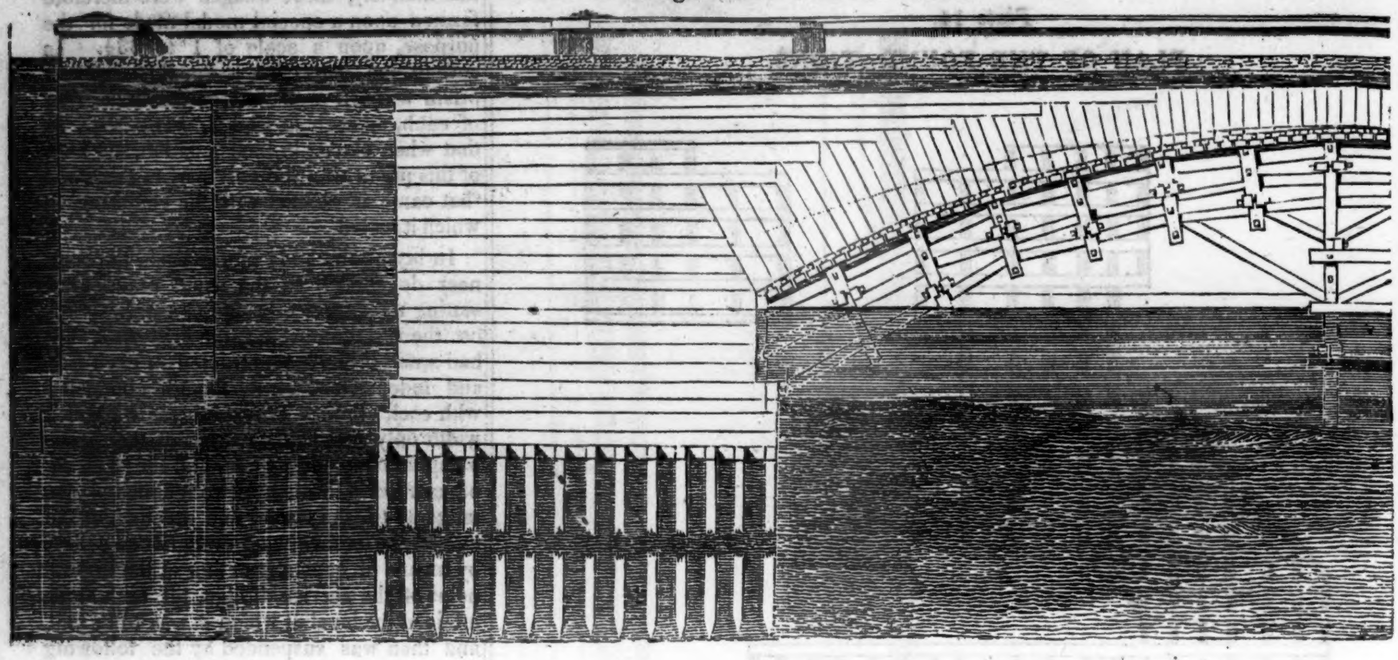
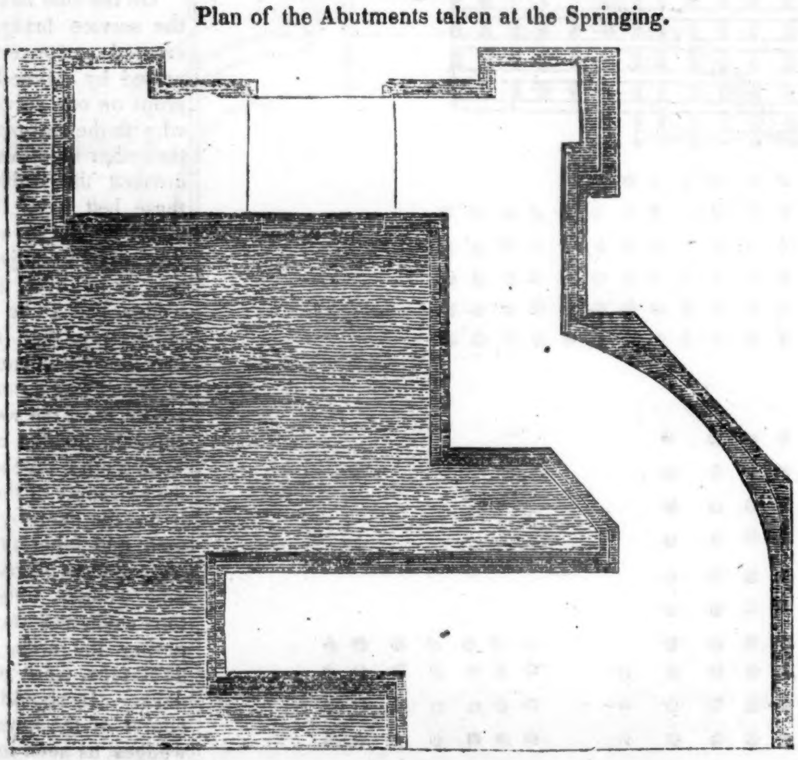


Fig. 3.

Plan of the Abutments taken at the Springing.



place by the descent of the parts about the centre of the arch, and the pressing of the joints of the wedges at the intrados near the springs and at the intrados near the key-stone, and consequently if the general pressure that must ensue on removing the centres, and in the subsequent settlement is not properly guarded against, it will chip off the edges of the voussoirs, and might very probably be followed by accidents of a far more serious and fatal nature. The engineer Boistard, to avoid those inconveniences in building the bridge of Nemours*, which is only 72.30 feet span, and 7.20 feet rise, had the wedges or arch stones cut somewhat smaller than they would have been, had the intended segments been divided by the determined number of wedges. He supposed that in removing the centres the voussoirs would not come quite close to each other, and directed them to be so placed that the intervals between the joints should vary in the direction of the intrados according to the terms of a decreasing progression from the spring to the key, and consequently in an inverse progression in the direction of the extrados.

But the engineer Mosca, in planning the bridge over the Dora, supposed, and with truth, that on removing the centering, the voussoirs should come completely in contact, and consequently he directed them to be cut exactly equal to an arch of the span of 147 63836 feet, and a versed sine of 18.04468 feet, and in the framing of it, as we have already mentioned, an arch was adopted for the centering, of the same span, but with a versed sine of 18.9015 feet, and decreasing proportionally to the springs where it intersects with the real segment. He directed also that the joints, instead of being on the projection of the radius to the centre of the arch, as is too generally the

*Buzani Antologia di Firenze.

Plate 15.

Fig. 2.

Half the Transverse Section taken through Centre.

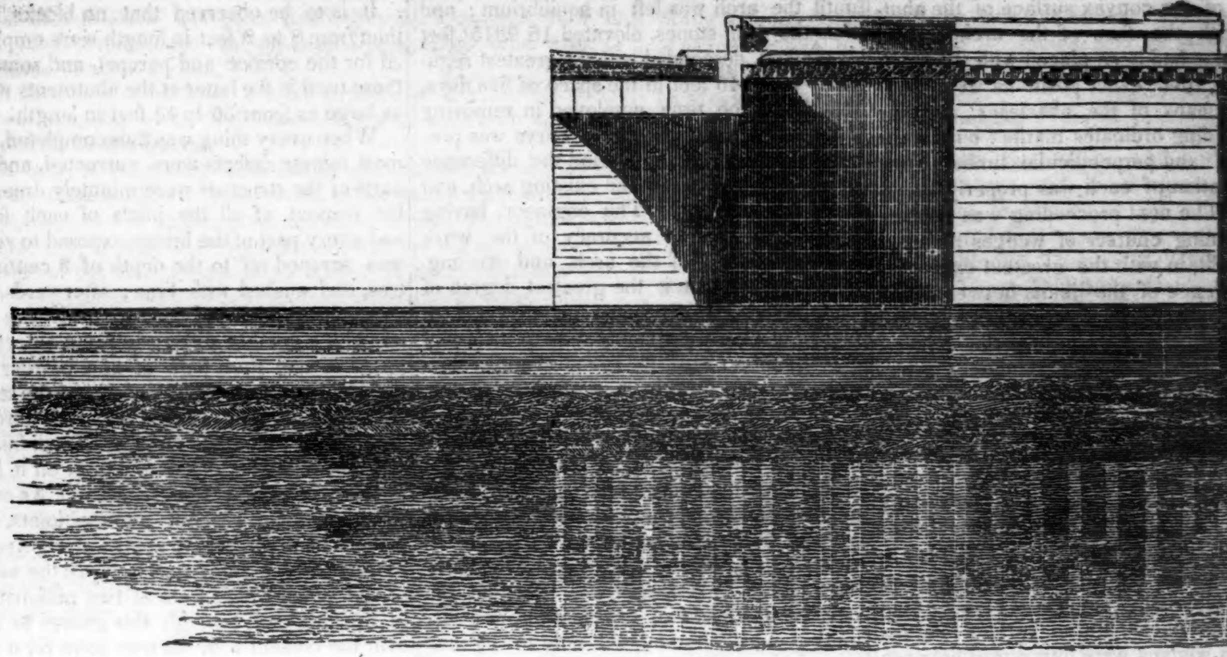
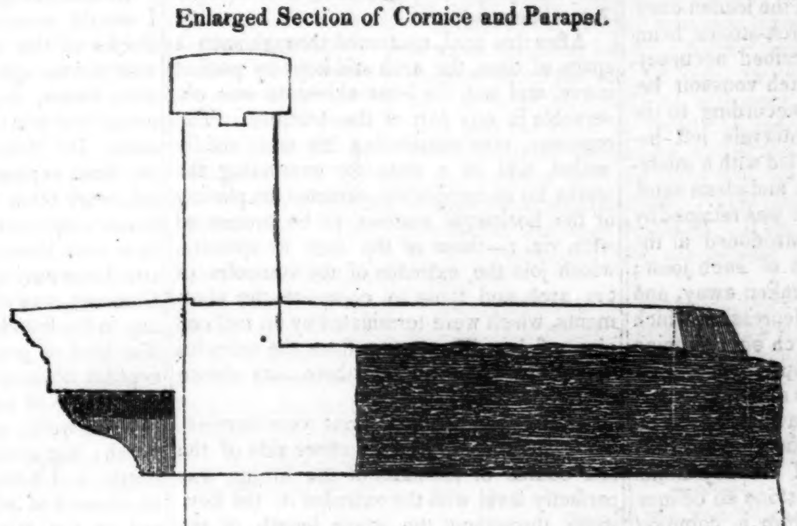


Fig. 4.

Enlarged Section of Cornice and Parapet.



case, should be so placed as to have the faces of contact of those near the springs diverging between themselves at the intrados in a decreasing progression proceeding from the impost, and of those near the centre diverging at the extrados in a similar progression proceeding from the key-stone. It is proper to state, that as the difference between the real arch and that adopted for the centres, was not of sufficient magnitude to enable the workmen, in so great a number of wedges, to establish the spaces between the joints according to the calculated progressions, in terms that they could physically appreciate during the erection, the engineer adopted the practical means of dividing the arch into three parts, and directed that in the lower, the joints should diverge near the intrados, that the voussoirs should be placed parallel in the second, and that in the last or upper they should diverge towards the extrados.

During the operations on the platform, the cutting of the arch stones, framing the service bridges and centres, with the superstructure of timbers for lifting and setting the voussoirs, the masonry of the abutments acquired the necessary consistency, and it was then judged proper to proceed with the construction of the arch.

In order to be able to rectify the position of the wedges by means of the calculated tables, an horizontal beam was placed below the arch in a steady position, independent of the centres, upon which were marked the abscisses; and the ordinates of the arch were designated upon two vertical timbers, established like the horizontal one, in an independent and steady position near the abutments.

The placing of the arch-stones was then begun, and carried on in the manner before mentioned, and with all necessary precautions; and besides those generally employed, the following peculiar process was put into practice.

The courses at the spring of the arch were first set; these were connected by crochets to each other, and to those of the face of the circular sides of the abutments which rise above the spring of the principal

arch of the faces, viz. up to the twelfth horizontal course; they were then cut and disposed in such a manner as to form the required angles at the *ugnature*, and at the meeting of the convex surface of the abutments with the face of the arch. After each course had been placed with the greatest nicety, their exact positions were verified by means of the abscisses, and the corresponding ordinates marked out on the horizontal and perpendicular timbers, and the inclination of each was properly ascertained. The next proceeding was to place the remaining courses of wedges; and in order to obtain with the greatest exactness the divergence of the joints between each voussoir, and to hold them in their required positions till the lowering of the centres, small plates of lead of a thickness determined by the terms of the fixed progressions were placed between those towards the impost at the intrados, and those towards the key-stone at the extrados, and the exact position of each was verified by means of the practical method established for finding the ordinates. With respect to those voussoirs forming the centre part of the arch, they being somewhat smaller than those of the faces, and of various lengths, small iron wedges were introduced between the joints to hold them in their desired diverging positions instead of the leaden ones. The work of setting the arch-stones being completed with the prescribed accuracy, and the final position of each voussoir being progressively rectified according to the detailed directions, the intervals left between the wedges were filled with a moderately liquid cement of lime and clean sand, mixed in equal parts, which was retained by a slight stuffing of tow, introduced at the lowest part of the aperture of each joint; the iron wedges were then taken away, and in order to ascertain the depression which would take place in the arch on removing the centres, another ingenious yet very simple and precise method was adopted.

A horizontal line was drawn over the total length of each face of the arch, forming a tangent at the intrados of the key-stone, and on each side of the key-stone an oblique line was drawn, starting from a common point at the centre, and tangential to the faces of the exterior arch forming the *ugnature*.

By means of those three lines drawn on each face of the arch, the least motion of the wedges, or voussoirs, would have been observed and determined, upon referring them to the established points of level near the impost of the arch.

Besides all these precautions, the engineer before removing the centres, directed that the cement should be scraped off all the joints of the arch-stones at the extrados as well as at the intrados to the depth of three centimetres, to prevent, in the settling of the arch, any chipping off the angles of the faces of the voussoirs: these spaces were again filled at the conclusion of the work.

All these operations being completed, and twenty days having elapsed from that on which the arch had been keyed, the lowering of the centres was begun. On removing the check pieces, the 240 wedges supporting the centres commenced with an almost simultaneous movement gliding down uniformly and insensibly, by the effects of the gravity of the arch stones and centres; and this motion was checked and repeated at intervals, until the arch was left in equilibrium; and thus the arch-stones, elevated 18.9015 feet at the key, descended with the greatest regularity to 18.40 feet in the space of five days, that being the time employed in removing the centres, and a beautiful curve was preserved, leaving at this period the difference of 4⅞ inches between the existing arch and the projected one. The engineer, having proved the perfect accuracy of the work and the solidity of the arch, and wishing, moreover, to give it the greatest degree of settlement of which it was capable, and of obtaining a mass absolutely stable, that would enable him to work its spandrill walls, cornice, parapet, &c., in a perfect level line, directed the arch-stone to be loaded with a mass, formed by a cube of ballast of 1854 metres and weighing about 3000 tons, which was disposed symmetrically over it, and was much beyond what the arch when completed, with all the additional stone-work and its greatest occasional loads, would ever have to sustain. This weight was left upon the arch for the space of four months, and the sinking under it amounted only to 1⅝ inch (4 centimetres,) leaving the difference in rise above the projected segment 2¾ inches (about 7 centimetres.)

After this trial, continued through such a space of time, the arch still kept its perfect curve, and not the least alteration was observable in any part of the structure. The engineer, now considering his arch solidly settled, and in a state for continuing the works for its completion, directed the placing of the horizontal courses to be proceeded with, viz.:—those of the face or spandril, which join the extrados of the voussoirs of the arch, and those to complete the abutments, which were terminated by an inclined plane of 1 in 35, starting from the extrados of the key stone towards them,—as shown in Fig. 1, Plate XV.

As soon as these operations were terminated it was verified that the upper side of the last course of the faces of the bridge was perfectly level with the extrados of the key stone, throughout the whole length of the bridge and approaches.

The blocks of the cornice were then placed in a horizontal position, and the whole surface of the arch-stones, abutments, and counterforts were covered with a stratum of bituminous cement of the thickness of 0.15 metres, well beaten till it became very hard; then upon this another stratum of 7 centimetres was laid, mixed with fine gravel, and beaten smooth without the least crack; by this coating of cement the filtration of rain-water was completely prevented. This operation finished, the space up to the level of the road was filled in regular and even strata; and when the whole was well settled and reduced to the prescribed form, blocks for the foot-path were laid down with a very slight inclination towards the roadway, and defended by truncated conical stones, as seen in the superstructure of the bridge in Plate XIV., and the paving was put down, consisting of a stratum of sand and gravel, of the mean thickness of 15 centimetres, and covered with a stratum of sand of 0.05 centimetres; then were put up the blocks forming the parapet and its crown—as shown in the cross section of the cornice, &c., in Fig. 4, Plate XV.

It is to be observed that no blocks less than from 8 to 9 feet in length were employed for the cornice and parapet, and some of those used in the latter at the abutments were as large as from 36 to 40 feet in length.

When every thing was thus completed, the most minute defects were corrected, and all parts of the structure were minutely dressed; the cement of all the joints of each face, and every part of the bridge exposed to view, was scraped off to the depth of 3 centimetres, and washed with lime; afterwards, all those parts which had been scraped were filled with a cement expressly prepared, composed of one third part of fine powder of marble, one third of fine powder of the same granite used in the bridge, and one third of lime, with a very small quantity of iron filings well mixed and rubbed together, till it had acquired a sufficient consistency. As soon as this cement was put into the joints, the masons were directed to apply a straightedge to them, with a groove cut in it just the width of the joints, which were of two millimetres in breadth, and through this groove to rub over the cement with an iron point till it became as hard as the stone itself.

In concluding the description of this work I should mention particularly, that all the blocks of the arch-stones, the face of the wall and the approaches, comprising the cornice, bands, foot-path, parapet and crown, are of the best Alpine granite, of the quarry called Del Malanaggio, near Pinerolo; and the faces exposed to view being finely dressed, every other face of contact of each outer block employed was dressed to equal fineness over three-fourths of its surface. A small quantity of granite from the quarry of Cumiana, was also used, but only as backing, in the foundations and abutments*. The first kind of granite is the best, and is susceptible not only of being dressed very finely, but also of being used in very small and delicate work, and takes besides a very high polish; the second kind is harder but more brittle, and contains many particles of iron, on account of which its surface, when exposed to the atmosphere, becomes spotted, which gives it a very disagreeable appearance, as may be observed in the bridge near Turin over the Po.

Finally, I have to state that this bridge was constructed in the space of four years†, under the immediate direction of the Chevalier Mosca, principal engineer, well seconded by

*Cubic specimens of these granites are deposited in the Institution of Civil Engineers with their faces dressed to the same degrees of fineness as the stones employed in the work.

†The above four years was the actual time employed in building this bridge; for the work was abandoned by the contractor about three years from its commencement, and after the lapse of some time, was taken up solely by the engineer and assistants; and brought to a termination very satisfactory, combined with the greatest possible economy; the bridge, comprising the approaches, having cost the Sardinian government the sum of £56,000.

his able assistants, and with much perfection and nicety, that to this day not the least settling has taken place in any part of the abutments or arch, nor the smallest crack, or chipping of the angles of the voussoirs or of any other block; and as the whole face of this work has been finely dressed, it appears now to the most experienced and practised eye a single solid mass of granite.

Indeed it is considered a noble structure and a perfect piece of workmanship by all professional men who have seen it, whether natives or foreigners.

It may be concluded from the foregoing observations, that the results obtained in the construction of this bridge are entirely conformable to those experienced arches of limited dimensions, and thence that it may be freely asserted, that the theory of the equilibrium of flat arches remains no longer doubtful, and that a sure process for their construction has been satisfactorily ascertained.

It must be cheering to the friends of Railroads to know, that of the numerous stocks in market, none have been less affected by the present depressed state of business, than the stocks of Railroads in successful operation.

The following report of the Directors of the Utica and Schenectady Railroad, will be found interesting to many of our readers.

UTICA AND SCHENECTADY RAILROAD.—The Albany Evening Journal says:

"The Directors of this Road, at their last Meeting, declared in a dividend of 7 per cent. on the $1,600,000 and at the same time made a call of $5 on each share, or $100,000, payable on the first of August."

From a circular recently published by the Company, we gather the following details. The *receipts* have been, for instalments, on stock, $1,599,750, of which $100,000 have been paid out of the income of the road; for interest on deposites, $5,574 41; —miscellaneous receipts, $999 17; INCOME OF ROAD $247,-938 41, to which may be added moneys actually received but not passed to the credit of the Treasurer, $9.754 12, making in all $257,692 29; money borrowed, $32,095 12. Total receipts $1,841,356 86.

The *expenditures* have been 1st, on account of construction of the road $1,708,894 04, the items of which are land for roadway $282,588 60, buildings $71,639 07, grading road $561,-787 59 Superstructure $515,733 57, outfit of Engines and cars $122,771 58, Engineering and superintendence $69,381,-51, amount paid for Mohawk turnpike road $62,500, incidental $157,137 40, and stock on hand $2,334 72:—2d. Transportation account for nine months, ending 31st May last, $77,753,-08, Dividend paid $104,709 75;—making the total payments for the Company $1,891,356 87.

The estimated annual income of the Utica and Schenectady Railroad Company is as follows:

From actual results ascertained from ten months operations on the Road, it appears that the gross receipts for the transportations of passengers during that period has been	$557,692.20
Add for the receipts of the remaining two months of the present year estimated to be in the aggregate the same as for the last two months, say	62,307.71
Total amount of receipts for the present year ascertained for ten months and estimated for two,	320,000.00
Assuming the receipts on the Road for transportation of passengers to be the same for any ordinary year hereafter as for the present current year, they will amount to the above sum of	320,000.00
Add for carrying the Mail of the United States, estimated according to its weight as stipulated in contract with Post Master General, say	20,000.00
Total estimated gross receipt of Road for an ordinary year,	$340,000,00
Deduct for estimated expenses	140,000
Leaving estimated net annual income to be divided among stockholders,	200,000.00

The estimate above made does not include any thing for future increase of travel on the Road, nor does it allow any thing for a contingent decrease, unless the deduction of $10,000 a year for contingencies be considered as such an allowance. Many persons believe that the increase of travel hereafter, will produce enough to renew the perishable part of the road, as often as it will require renewal—if so, the dividend of profits will be greater than above estimated.

SARATOGA AND WASHINGTON RAILROAD.—At a meeting of the stockholders of the Saratoga and Washington Railroad Company, held in the village of Waterford on the 5th inst., the following gentlemen were elected directors for the ensuing year: —John Townsend, Erastus Corning, Thomas W. Olcott, Lewis Benedict, John L. Graham, George D. Strong, David Codwise, Le Grand Cannon, Richard P. Hart, Stephen Warren, Gideon M. Davison, Thomas J. Marvin, Roswell Weston, John H. Boyd, John B. Borst.—[Troy Budget.]

THE MORRIS AND ESSEX RAILROAD, we are gratified to learn, is steadily progressing towards completion. The Jerseyman mentions that the whole line is completed to within one mile of the public square in Morristown and the contractors are busily engaged in laying the timbers and rails—all of which are on the ground. The Company hope to open the road to the public on the 15th September next.

THE LONG ISLAND RAILROAD.—Fare reduced.—A trip may be made to Hempstead all the way for five shillings. The fare to the Court house opposite Hempstead is 3s 6d.

As the warm weather increases there will be a great increase of travel on Long Island. All the variety of incident to render summer delightful may be found in the different villages. Sites may be found airy and cool, with delightful prospects—sportsmen may beat the forest or tread the marsh for game—for fishing there are great advantages, and as the fare of the Railroad is reduced we have no doubt many will take an occasional excursion at least as far as Hicksville. This place has a large public hotel, two stores, and other buildings. It takes its name from its founder, Mr. Valentine Hicks, the present President of the Railroad Company.

Hicksville forms the present termination of the road, and it may be some time before it progresses further eastward.

Whose is the fault of its discontinuance at the present spot, and of the inability of the Company to proceed further is yet to be discovered.

As citizens of Long Island we trust the means may be found to render the work of more extensive utility.

From the New-York Mechanics' Magazine

ELECTRO-MAGNETIC MACHINE.

We have been not a little surprised by an article on this subject in the May No. of the Journal of the American Institute, and which we herewith give to our readers.

It will be found very difficult to reconcile the announcement that the article "comes from one of the best informed and most experienced men in the community," with the article itself, showing, as it does, gross ignorance in regard to some of the plainest facts and principles of science.

Indeed were it not for the authority given by this announcement, and operating upon the minds of those who have not paid much attention to this subject, we should not have noticed a collection of errors and misrepresentations, sneeringly aimed at Prof. Silliman as well as the inventors of the machine in question.

The writer, in the first place, endeavors to prove that the *vacuum* existing between the surfaces greatly increases the apparent power of the magnet itself. Now this argument does not hold good in the case of the large electro-magnets constructed by Messrs. Cooke and Davenport, (if indeed it does in any other,) for they prefer a slightly *curved surface* for the armature.

The objection as to the "serious mechanical difficulty," to be encountered in performing a rotary motion near to the magnets without touching them, proves at once that the writer either has not seen the machine, or that he does not understand the laws of mechanics.

The several conclusions of Prof. Silliman, are said by the writer to be *examined* by him. To the first conclusion, viz: that electro-magnetism is adequate to produce a rotary motion, the following rejoinder is made: "So is the slightest breeze acting upon the boy's windmill, yet its power is of no value." This is what "one of the best informed and most experienced men in the community" calls an *examination* of the conclusion of Prof. Silliman. We would beg leave to ask, what becomes of the power of the slightest breeze when acting upon the *man's* windmill, is it of no value?

The second conclusion is *examined* by the following question: "What proof have we that the machine will not become permanently magnetised, and come to a stand still?"

Now this question again places the writer in a dilemna—ignorance, or misrepresentation, are the only alternatives. In the first place the revolving magnets are neutralized, by having their poles reversed 300, or as many times as there are revolutions per minute. Besides the material used is soft iron, and loses its magnetic property the instant communication with the battery is cut off.

The third conclusion is *examined* by a quibbling comparison between the renewal of acid and battery, and the supply of fuel to the steam engine. In the steam engine both fuel and water are consumed, and the bare assertion, that the cost of fuel for a steam engine and materials for a galvanic machine, will be equal, is no proof of the fact, while observation, so far, shows that it is not a fact.

The *examination* of the fourth conclusion contains a very pretty piece of advice to Prof. Silliman, in which he is told to wait till "experience" shall warrant him in asserting that the power may be greatly increased, &c. We suppose the experience of "one of the best informed and most *experienced* men in the community" is meant. Long life to the worthy man if he waits such an event.

In several places, the fact that several thousand pounds were "sustained" and not "raised," is hurled at Prof. Silliman with force enough to destroy him and the machine, if said fact had any weight, which, fortunately for the cause of science, it has not. In the instance alluded to, the weight was a dead mass, while in this machine the attraction and repulsion of two magnets is constantly operating. Besides, if a small machine, in which the interval between the stationary and revolving magnets is proportionably very great, can raise 24 lbs. one foot in one minute, may we not expect a very useful power in a larger one, especially when we know that the power of an electro-magnet increases in a much greater ratio than the size of the apparatus.

We must apologise for having detained our readers so long over such a bundle of absurdities,—but we cannot quietly witness an attempt to cast ridicule upon scientific experiments, or upon so bright an ornament to the cause of science as Prof. Silliman,—though we are, perhaps, giving more notoriety to the nameless author of it than he deserves.

Notwithstanding the laughable assertion that the writer "does not go the full length with that distinguished philosopher" ! ! !—it must be evident to all having the slightest knowledge of the subject, that he is ignorant to a great degree of the principles of the sciences of the construction of the machine, and of the courtesy and politeness (to say nothing of modesty) usually practised among scientific *gentlemen*—however much his attainments in some other line may entitle him to the distinctive appellation of "one of the best informed and most experienced men in the community."

ELECTRO-MAGNETIC MACHINE.

We copy the following article from the Journal of the American Institute.

The following communication comes from one of the best informed and most experienced men in this community. Although he does not go to the full length with that distinguished philosopher, Professor Silliman, whose researches and writings have done so much honor to himself and his country, still our correspondent is disposed to award to him high praise for the benefits his labors have accomplished in science and the arts.

If the electro-magnetic machine fails when put in competition with steam, as a rotary motive power, the experiments made for that purpose may, notwithstanding, conduce to other discoveries of hitherto hidden agencies concealed in the loadstone, as important to the human race as that which points the needle. Mr. Davenport, it seems to be admitted, has found a new path, and gone ahead of others in his experiments. We hope he will push on, and ascertain where it leads. Every advance into the field of discovery extends the prospect, and facilitates other and greater discoveries. Every rational aid should be administered to Mr. D. by those who are in possession of the means, to enable him to prosecute his improvements to the full extent.—Ed.

In the April number of the *American Journal of Science*, there is an article by the editor, Professor Silliman, giving a description of this machine, invented by Mr. Davenport, which is well calculated to mislead, by its specious assumptions. It is my purpose to examine some of the Professor's views, and compare them with well established facts, and see how far his opinions in this matter are entitled to consideration. The subtle elements which surround the earth are capable of various modifications, and when acted upon by sudden and violent changes of temperature, we witness astounding results. The production of steam, by the combination of the matter of heat with water, is among the most familiar and powerful changes produced by a new order, in position of these two elements.

The best arranged steam engines, in England, raise 625 tons one foot high, by the consumption of one pound of coal. It appears that the Professor had seen "*twenty-eight* pounds raised from the floor," by Mr. Davenport's machine. He says, that Professor Henry has succeeded in "*lifting thousands of pounds by a battery of very small size.*" If Professor S. will examine the facts, he will find he had been led into a great error when he supposed the *thousands of pounds* were *lifted*; they were only *sustained*, or held in contact with the magnet, and lifted by some other force.

In this case, the electric fluid produces a vacuum between the surfaces of the magnet and the body suspended; thus giving full effect to atmospheric pressure, on the surface of the weight or body suspended. Besides, there is no similarity in the two cases; in the one, the surfaces come in contact before any sensible effect is produced, and in the other, the surfaces must remain at certain distances from each other, to admit of free rotary motion; and here comes a serious mechanical difficulty, in the formation of these machines of great magnitude. Great nicety must be observed, to keep the moving electro-magnets from touching the permanent ones, and so *close*, that they shall not fall out of the sphere of attraction. The natural tendency of bodies is to a comparative state of rest. The electric fluid obeys the same law, however intensely it may act on the nerves of an enthusiast.

The Professor has arrived at six conclusions, after having seen, read, and reasoned about the "*electro-magnetic machine.*" These must be examined, and they are quoted for that purpose.

First. "It appears then, from the facts stated, (in the former part of the article,) that" "*electro-magnetism*" "is quite adequate to the generation of rotary motion."

So is the slightest breeze acting upon the boy's windmill, yet its power is of no value.

Second. "That it is not necessary to employ permanent magnets in any part of the construction, and their *electro-magnets*

are far preferable, not only for the moving, but for the stationary parts of the machines."

What proof have we that the machine will not become permanently magnetized, and come to a stand still?

Third. "That the power generated by electro-magnetism may be indefinitely prolonged; since, for exhausted acids and corroded metals, fresh acids and batteries, kept always in readiness, may be substituted, even without stopping the movement."

So, by keeping a stock of coal on hand, and applying it to the generation of steam, the engine may be kept in motion.

Fourth. "That the power may be increased beyond any limit hitherto attained, and probably beyond any which can be *with certainty* assigned," &c., "it would appear certain that the power must be increased in some ratio which *experience* must ascertain."

When the Professor came to this conclusion, it is evident that he did not then possess sufficient information, and had not sufficient "*experience*" to enable him to give a rational opinion of the value of this new machine. Hence, as the editor of a scientific journal, he ought to have waited till "*experience*" had taught him the difference between the *suspension* and the *raising* of great or *small* weights, or the experiment had been fairly tested.

Fifth. "As *electro-magnetism* has been experimentally proved to be sufficient to *raise* and *sustain several thousand pounds*, no reason can be discovered why, when the acting surfaces are, by skilful mechanism, brought as near as possible, without contact, the continued exertion of the power should not generate a continued rotary movement, of a degree of energy *inferior indeed to that exerted in actual contact*, but still nearly approximating to it."

Now, this "*conclusion*" is sufficiently indefinite, and we are left to *conclude* what is really meant by it. We see that a continued rotary movement can be produced by "electro-magnetism," and we are left in the dark as to the amount of power generated, and the cost of its production; and are asked to believe that it is something very great, without being put in possession of any facts beyond that of "*twenty-eight pounds having been raised from the floor*," as the foundation of our faith.

Sixth, and last conclusion. "As the power can be generated *cheaply and certainly*—as it can be continued indefinitely—as it has been greatly increased by very simple means—as we have *no* knowledge of its limit, and may therefore *presume* on an *indefinite augmentation of its energy*, it is much to be desired, that the investigation should be prosecuted with zeal, *aided by correct scientific* knowledge, by *mechanical skill*, and by *ample funds*. It may therefore be reasonably hoped, that *science and art*, the handmaids of discovery, will both receive from this interesting research a liberal reward."

This last conclusion forcibly reminds us of the practices of our people the past few years, in the pursuit of wealth. They concluded that wealth could be "*greatly increased*" by very "*simple means*," and with *certainty*, and that it might be "*continued indefinitely*." To our dismay, we have just found out, that like many patented inventions, we had been speculating without "*correct scientific knowledge*," or "*ample funds*" to sustain us in the vain attempt.

We regret to find one who has made a football of pernicious scientific theories, and who, by the force of his facts and reasoning, has overturned many untenable propositions, should have relaxed from his usual caution, and have virtually recommended the application of a power of "*unknown energy*," before having seen some useful effect produced by it.

The following communication from Mr. J. Perkins will be found highly interesting.

From the Journal of the Franklin Institute.

OBSERVATIONS ON THE DUTY PERFORMED BY THE CORNWALL STEAM ENGINES.—BY JACOB PERKINS, CIVIL ENGINEER. READ BEFORE THE INSTITUTION OF CIVIL ENGINEERS, LONDON, FEBRUARY, 16TH, 1836.

DEAR SIR—I herewith transmit for your examination, and for insertion in your Journal, should you think proper, a series of three papers, upon the duty performed by the Cornwall steam engines. Yours, &c. J. PERKINS.

The true cause of the great difference of duty performed by the Cornwall and the best Boulton & Watt engines, has been a matter of serious inquiry for the last fifteen or twenty years. But within the last two or three years the difference has been so astonishing as to induce many engineers to suppose that some part at least was owing to trickery.

If we do not admit the fact of the superiority of the Cornish engines, the cause will not soon be found. I must say that after much thought, investigation, and experiment, I believe that the Cornwall Engines do at least three times the duty that the best low pressure, condensing, double stroke engines do; and I have no doubt that I see the reason of it.

Having, in the first place, visited the Cornwall Mining establishments to judge for myself, I very soon came to the conclusion, that the advantage which the Cornish single stroke engine has over the reciprocating double stroke engine is much more owing to the difference in the construction of the engines, than in that of their boilers. Very few engineers know the great value of using high steam expansively, and many of those who admit it, do not know how to apply it properly.

The repeated experiments which I have made have satisfied me that the single stroke engine is far better calculated for taking advantage of the valuable property which the expansion of high steam possesses than the double stroke engine. The loss from this cause is much greater than is generally believed. In the first place, there should be no steam lost between the steam-pipe and piston, which cannot be avoided in a double stroke engine. In the second place, at the end of the stroke the steam should be allowed to escape without any re-action, and this cannot take place, when the induction and eduction pipes are used at each end of the cylinder, as is the case with the double stroke engine.

If the induction pipe is large enough to allow the steam to escape freely so as to prevent loss by reaction, then the eduction pipe would be much too large for the induction pipe, and much high steam would be lost, without having the benefit of expansion. In fact, it is impossible to get the steam on and off soon enough in the double stroke. It is supposed by some that there is a loss by having the steam on one side of the piston only; it is, however, quite the reverse. It is very well known that the larger the piston the greater is the saving, particularly in the piston itself. To make the single stroke engine consume the same steam as a double stroke engine, the cylinder must be double the area.

If it should be said that much time and power is lost by not having the steam on the piston on the return stroke, it may be said in answer, that if only fifteen strokes are made in a minute, there would be but two seconds between the working strokes; and that the fly, when the fly is used, must be very light indeed to show any variation of speed. When worked in the Cornish fashion, without the fly, no power can be lost between the strokes.

I do not mean to say, that all the gain is to be attributed to the single stroke engine, there is undoubtedly much power saved by dispensing with the fly wheel, where the work to be done is pumping water. This is proved by the fact, that a single stroke, balance bob, low pressure, pumping engine will raise 33,000,000 lbs.; while the double stroke low pressure engine with a fly-wheel will raise but 22,000,000 lbs. The fly is a power which will not, like steam, wait to accommodate itself to the stubborn visinertia of the water, neither will it accommodate itself to the going off of the steam, consequently much power must be lost. When one watches the beautiful accommodating action of the Cornish pumping engine he will readily see, that there must be great loss in using the ponderous fly. When the steam is first let on to the piston, the pressure, although 40 lbs., to the square inch, it seems too little for its work, and appears to labor hard to get the water in motion, but at the end of the stroke, although the steam has expanded down to 10 lbs., to the inch, the work seems quite light. Here the expansive property of high steam is beautifully exemplified. To begin the lift 40 lbs., to the inch seems not enough, but when the stroke is ended, 10 lbs., seems more than is wanted. How is it with the condensing double stroke engine? Is not the power the same at the end of the stroke as at the beginning?

I cannot believe that the enormous quantity of 125,000,000 of water was raised one foot high with 84 lb., of coal without the assistance of a little air, which certainly can be used with-

out being readily detected. To show how I learnt this singular fact, I must be allowed to relate a curious trick which was attempted to be passed off on me in America about forty years since. Two honest farmers, one day called on me to see if I would join them in a patent of great importance; they stated that the discovery would prove that the law was erroneous which stated that water would rise only about 32 feet in a vacuum. I told them that it was contrary to what I had learnt and declined having any thing to do with it; they, however, would not be put off. They said that they had brought with them an exhausting pump, which had raised water 100 feet by rapid exhaustion, and that they would pay all the expenses of fitting it up, and that I could then see who was wrong. One of them averred that he was a ruined man if he had been deceived. I was so satisfied that he had been imposed upon that I readily agreed to test his pump. I had a leaden pipe attached to the double barreled exhausting pump, and the situation I had fixed upon happened to be 44 feet from the water to the pump. When the pump was put in action, it, to my great surprise, delivered the water at the pump spout. I then set myself to work to discover the cause, which was not ascertained until the third day; I observed that the water appeared full of air bubbles, it then struck me that air was allowed to mix with the water in minute portions, by which means the column of water became expanded? I then placed my ear close to the pipe and soon discovered a singing noise, and by clasping the tube with my hand the noise stopped and the water ceased to flow. Here was the trick; by examining the tube I found that it had been perforated with a small pin-hole unknown to me, which admitted just air enough to expand the column. I then charged the men with the imposition, one denied it, but the other looked pale, and acknowledged he had done it b ythe direction of the inventor, who said that it must be kept a secret, otherwise the invention would be infringed upon. They were now made to understand that they were duped, and were soon on their return home, minus 3000 dollars.

Having seen that a column of water might be expanded by admitting air under the lower clack, I was induced to inquire, while in Cornwall, of an Engineer, if he had ever known air to have been admitted under the clack; after expressing his surprise at my question he admitted that it was common, but that it was not acknowledged, since every one wished to have it appear that they had done as much duty as possible.

Since the quantity of water pumped was known by the number of strokes per day, and as the contents of each stroke was known by its length, and by the diameter of the plunger, if the air which the water contained was not allowed for, more work appeared to have been performed than had actually been done.

My friend stated that it had been found advantageous to allow air to be admittted in small portions, for it made the pump work more lively in consequence of the spring it gave to the column of water and caused less strain to the machinery, but that he never knew the air allowed for. Although this circumstance of admitting air to mix with water serves to lessen the amount raised, yet this cannot, I think, be more than 15 or 20 per cent., and I fully believe 90,000,000 lbs., have been raised one foot high by a bushel of coal.

The following statement of a series of experiments which were made at Saint Catherine's Dock about ten years since, with a high pressure single stroke expansive engine, I think conclusive.

Extract from the London Journal of Arts and Sciences, of July 1st, 1827.

PERKINS' NEW STEAM ENGINE.

"We have the pleasure of announcing that Mr. Perkins has at length, in a very satisfactory manner, proved the superiority of his newly constructed high pressure steam engine, by working it against two other steam engines upon the low pressure principle.

"This small engine, which we have several times mentioned in our present volume, has been within these few days set up at Saint Catherine's Dock, and employed in pumping water from the excavation.

"There have been four steam engines engaged in the prosecution of these works, two for excavation, and two for pumping out the water; Mr. Perkins' engine stands alongside a low pressure engine of sixteen horse-power, which is determined by the area of its piston.

"The diameter of the piston, that is the bore of the steam cylinder, of the new high pressure safety engine is eight inches, and its stroke twenty inches. It was connected by gear to a beam that made sixteen vibrations per minute, and raised two alternating pump buckets, the diameters of which are fourteen inches, and their strokes three feet three inches.

"We, the undersigned, certify that there are two low pressure steam engines employed night and day in discharging the water which flows into Saint Catherine's Dock from the land springs, &c., that one of them is a sixteen and the other a ten horse engine. We also certify that Mr. Perkins has recently put up a small high pressure steam engine, the diameter of whose piston is eight inches, its stroke twenty inches, and that we have seen this engine pump the same quantity of water from the docks which has heretofore been pumped by the other two.

JAMES LAMON,
PEARSON WOODWARD,
THOMAS BROWN.

"I, the undersigned, certify that I have superintended and put up Mr. Perkins' high pressure safety engine. I also certify that what is stated by the above Engineers is true, and that it was done with only 42 lbs. of coal per hour. Having been engaged 22 years in making and putting up engines, principally in Cornwall, it is not likely that I could be deceived as to the power and efficacy of this engine, and I conscientiously believe that two-thirds of the coals used in this country might be saved by the use of this engine. HENRY HORNBLOWER.

"I, the undersigned, carefully weighed the coals and placed them under Mr. Perkins' generator, that 42 lbs. weight of coal only was used per hour. I also certify that what is stated by the above Engineer respecting the work done is true.

WILLIAM HEARNE.

"Mr. Perkins is of opinion that the two low pressure engines could not have been worked up to their full power, although they used the full quantity of coals, three and a quarter bushels per hour; but admitting they worked at only two-thirds of the power, there would be a saving of about three-fourths of the coal consumed in low pressure engines, by the employment of Mr. Perkins' new principle."

In the above experiments the difference in favor of my single stroke high pressure expansive and condensing engine was quite as great as that which exists between the Cornish and the Boulton and Watt engines. Does not this prove that the enormous gain is chiefly owing to the great superiority that the single stroke, high pressure, expansive and condensing engine, has over the low pressure, double stroke, condensing engine?

Not long since John Taylor, Esq. published an account of a great improvement which had been recently made in Cornwall. He stated that a single stroke, high pressure, exhausting engine, had been converted into a rotary engine, and that it was greatly superior to the double stroke engine, so much so that it astonished every one who witnessed its power. I could not at first comprehend what he meant by converting a single stroke engine into a rotary one. I finally concluded that a fly-wheel must have been substituted for the accommodating balance bob used for pumping in Cornwall. This conjecture I have since found to be correct.

Whether the engine uses the steam on one or both sides of the piston, they are both undoubtedly reciprocating engines, and are called by that name.

That the single stroke engine, worked by high steam and expansively, is a very great improvement, the above mentioned experiment fully demonstrates. The fact is, that the higher the steam can be practically used, and the sooner it is cut off, the greater is the economy.

I should mention that at the time these experiments were made at Saint Catherine's Dock, I had not overcome all my practical difficulties, for the generators would fur up and then burn out. I, however, had no reason to despair, for although the cost of wear and tear of the generators was greater than the common boilers, yet the saving otherwise was far greater. I have, however, recently been so fortunate as to remove all objections, by a new modification of the generators. I have good reason to believe that a voyage might be made to India and back without finding the boiler in the least foul, or perceptibly fire-worn.

I have not a doubt that two single stroke, high pressure, expanding engines, might be used to great advantage in steamboats, and that the time is not distant when it will be more economical for merchantmen to navigate by steam than by wind. It will undoubtedly be said by some that the power so applied would be too unequal. If a more equal, or rather continuous, power is wanted, why do not the barge-men of the men-of-wars gig, have some of their oars always in the water.

I have often been asked, why I did not follow up the patent, If I was satisfied that there was no fallacy in the result of my experiments. My answer has been, that very soon after I had completed those experiments my monied partner failed and died, and his creditors put the patent in chancery, where it now remains, and I was obliged to turn my attention to other means to obtain a living.

When this experimental engine was worked with steam at a pressure of between 300 and 400 lbs. to the inch, I believe the induction valve was not opened more than about $\frac{1}{16}$ part of the stroke, if so, the annexed diagram will show the great gain.

Let Figure 1* represent a steam cylinder divided into 16 parts. Let the steam at 200 lbs. per inch be admitted at the dead point. Now fill the first divisi n, No. 1, then let the steam be cut off and it will at that point be 200 lbs. to the inch, next let it expand to No. 2, it will then be at 100 lbs. the mean will be 150. Again let it expand to double its space and it will occupy two of the divisions and leave off at 50, the mean 75 lbs., which amount to another 150 lbs. In expanding to 4, it will leave off at 25 lbs., the mean $37\frac{1}{2}$, the 4 divisions at $37\frac{1}{2}$ will give 150 lbs. more; after expanding down to 16 it will be only $12\frac{1}{2}$.

If the steam had been let into the cylinder at $12\frac{1}{2}$ lbs. per inch and continued so until the cylinder was filled with steam at that pressure, then the work done would be equal to 200 lbs. amounting to just the same weight of steam when at 200 lbs. to the inch in the first division, although the piston had made only $\frac{1}{16}$ of its stroke, the other $\frac{15}{16}$ of the stroke which was acting expansively, was clear profit.

It will be seen by diagram, Fig. 2* that although the steam on the piston is but $\frac{1}{16}$ part of the stroke, yet it was acting $\frac{1}{4}$ of the time; but what is the difference in the virtue of the two? it is as 800 to 200. This I do not say is mathematically correct, but I believe it to be near enough to give a pretty correct idea of the great practical advantage of using steam expansively if properly applied. Great credit is due to Hornblower, Trevethick, Wolf, and Evans the fathers of high steam. They elicited the spark which has since thrown such a lustre over the science of steam.

If I have done anything in the advancement of high steam, it is in consequence of witnessing the experiments of my countryman, Oliver Evans, the father of high steam in America.

The Editor has received the foregoing, from his friend, Mr. J. Perkins, together with two other papers upon the same subject, which will appear in the next number. He has also, from the same gentleman, some remarks upon steam engine explosions, controverting certain deductions made by the Committee of the Institute in their report upon that subject, which shall also appear, together with extracts from a letter which accompanied these papers, but which could not be prepared in time for this number. The letters and papers were delivered to the care of a gentleman, coming to this country, nearly twelve months since, but, from accidental causes, they have but just come to hand.

* Not forwarded, but see Vol. 4, p. 24, first series of this Journal.

Agriculture, &c.

From the Journal of the American Institute.

HINTS ON THE CULTIVATION OF THE MULBERRY, WITH SOME GENERAL OBSERVATIONS ON THE PRODUCTION OF SILK, BY LEWIS TINELLI, DOCTOR OF CIVIL LAW IN THE UNIVERSITY OF PAVIA, AND FORMERLY PROPRIETOR AND DIRECTOR OF A FILATURE OF SILK IN LOMBARDY.

Concluded.

"The young trees thus planted and manured, ought to be cut off, even with the ground, with an instrument having two cutting edges, and made in the form of pincers. At the end of a month the roots will have sent forth shoots, perhaps two feet high, if the season has been favorable, and rather wet. At this time, the diligent cultivator must watch to see that no parasite herbage grows among the mulberry plants; he will also give close attention to take off with his thumb the young buds that put forth along the stem, which ought to be clear and straight, in order to make a good tree at the age of three or four year. * * *

"When the seedlings of the nursery have acquired the thickness of an inch and a half in diameter, then is the time for taking them up, and transplanting them to their destined places in the fields. This operation is performed from the middle of March till the end of April; and requires considerable diligence, both in taking up the trees, so as not to spoil or damage the stem, and also in replanting them. It is necessary to cut carefully, with a well sharpened knife, all the branches of the young trees close to the stem, without, in so doing, inflicting any serious wound upon the tree. The stem should be cut to the height of about six feet. All the roots that have been a little injured, must be cut off. The trenches to receive these trees, vary from five to seven feet in width, according as the soil is more or less strong. In stiff and argillaceous ground, the trench ought to be larger, so that the roots, finding the earth soft and loosened, may the more easily extend themselves. If the trenches are prepared at the close of the previous autumn, they would be a great advantage. The depth should not exceed two feet, in order that the roots, not being too deeply buried, may feel the influence of the sun's rays. Horse dung, not too dry, and sheep dung, make the best manure.

"The cultivator will do well to put a stake, firmly driven into the ground, by the side of each tree recently planted, and tying the tree to it. The wind will thus have less power to disturb the tree, and draw the roots out of their proper places."

The engrafting by rings, is recommended, as giving strength to resist the winds:—choose a fine day in the beginning of May: select the shoots of the preceding year:—

"The branches from which the rings are to be taken, should be cut from the tree in the first fortnight of April, when the sap has ascended to the limbs, and to the very extremities of the branches. After having cut them off, it is the custom to bury them in sand, a little moistened, for fifteen days, in order to render the bark more flexible, and easier to be removed. The operation of inoculating is very easy, and may be learned with three hours exercise, after seeing it done by an able inoculator.

"During the whole year in which the inoculation has been performed, care is taken not to suffer any other shoots to grow than those which are inoculated, and which are intended to form the crown of the tree. All the other buds are gently rubbed off with the fingers. The following year, in the month of March, it is well done to cut the young engrafted branches, leaving three eyes between the place of inoculation and the extremity. This operation surprisingly concentrates the strength of the tree, which, the same spring, sends forth very flourishing branches.

"Generally, only three branches are left, which form, with their subaltern shoots, a fine crown or top to the tree. It is always useful to cut off the branches that have taken an ill direction, or become thorny, or too much weaken the plant. This ought, however, to be done only before the sap has recommenced its circulation; that is to say, between the beginning of Febr ary and the middle of March. At the same time all the little branches or extremities should be lopped off that have perished by the cold, or any other accident. Whenever a mulberry tree has become thorny, and languid in its vegetation—producing only yellowish leaves—not a moment should be lost in giving it a renewed strength, by pruning away all the branches, even the largest, close to the top of the trunk, which will be renewed by this operation, so as to put forth fine and vigorous shoots."

The culture of trees of low stature, are also recommended:

"This new method is now generally adopted in Italy, as the most advantageous under the circumstances. First, because the produce of the little mulberry is much earlier than that of the large ones; for in the third year they begin to gather the leaves from hedge rows, while six years are required before we can

strip the large trees. Secondly, because the low trees, being more immediately affected by the warmth of the soil, commence to put forth their leaves fifteen days earlier than the large ones; which is certainly a very great advantage. Thirdly, the care of the low trees, and the gathering of the leaves, are left to children, which is a considerable saving of expense. The hedge rows, being also less exposed to the violence of the wind, and more within the effects of the manure, are less endangered by frost, and feel less sensibly the extremity of cold.

"The trees of low size, planted in hedge rows occupy the least possible space, while, at the same time, they supply a crop as perfect as those of greater height, and their leaves, extremely agreeable to the worm, furnish a silk of the first quality. For the purpose of making plantations of this kind, young trees of one year's growth are used. The hedges are planted in lines, extendi g the entire length of the field, and separated from each other by a space of six feet, in which it is usual to raise some other kind of produce, as Indian corn, potatoes, beans, turnips, &c. Each tree is planted at the distance of three feet from the rest; so that, in the space of an acre, or 43,560 square feet, it is practicably to raise two thousand four hundred and twenty of these small trees. They will yield, in their third year, at least two pounds of leaves each; and this quantity will be doubled annually, till the eight year, provided they are cultivated, attended to, and managed, as is requisite.

"Although the young trees, when planted, are furnished with very small roots, yet it is necessary to dig the trench, made to receive them, of considerable depth. It is usual to make it one foot and a half deep, and of the same breadth. When the little trees are set in the ground, the stems are cut so as to leave only three eyes above the ground. The branches from these eyes, are to be engrafted the following year, so as to give the leaves a perfect resemblance in their quality—an essential point which should never be left out of view, if we could wish to have a perfectly good produce.

"If the gathering of the leaves could be finished by the end of June, it would be very advantageous to the trees, because they would then have so much time, in the period of their second vegetation, to send forth fine branches for the next year's gathering. It is necessary, also, carefully to prune off all the smaller branches that have been broken or wounded, in the gathering of the leaves."

From Mr. T.'s remarks in his closing article, it would seem that what he has before stated, with respect to the most congenial soil for the mulberry, is not intended to apply to the *morus multicaulis*, inasmuch as he states, (p. 52,) that it does not require any particular soil as exclusively suitable to its growth—but prospers even in a wet soil, and puts forth its leaves sometimes earlier than other mulberries.

From the Journal of the American Institute.

SILK.—REPORT OF THE COMMITTEE ON AGRICULTURE TO THE LEGISLATURE OF OHIO.—PRESENTED BY MR. IHRIG.

The committee on agriculture, to whom has been referred the petitions of many citizens of this State, praying for the favorable interposition of the legislature to encourage the cultivation of silk, have had the subject under consideration, and now ask leave to report—

In commencing their investigation, your committee were induced to inquire into the fact, whether Ohio possessed any agricultural productions which, strictly considered, could be regarded as staple commodities, the permanent and continued cultivation of which would lead her to wealth and prosperity. We find on examination, that most countries of long established prosperity, have pursued the cultivation of some one leading article, which has lead its inhabitants to affluence and superiority. China cultivates her tea crop and her silk worms; Java her rice and her spices; Asia Minor, her olives; Turkey, her opium; France and Italy, their wines and silks; Spain, her wool and indigo; Ireland her flax; Russia, her hemp; and other countries of the old world, those various commodities which seem to be best adapted to their soils and climates. In the new world, Mexico is already famous for her cochineal, the West India Islands for their sugars and their fruits, and in our own happy land, many of these States are celebrated for their leading productions. Tobacco, cotton, coffee, hemp, and sugar, have already become staple commodities in our immediate vicinity. We are satisfied, that the production of these articles tend to increase those leading articles of food, which are so essential to the support of a population, and of consequence, that those States are the most wealthy who have introduced them. They form a sound basis for commercial prosperity. That nation or State who can exchange the greatest quantity of her produce for the money or produce of other countries, is most sure of a dense and wealthy population; and it is perhaps wisely ordained by Providence, that while the productions of other countries are made necessary to us for the full enjoyment of our comfort those nations are, in turn, obliged to depend upon us for some articles equally essential to them. In the mutual operation of supplying and of being supplied, lies the principle of commercial prosperity; and the greater the surplus produce to be exported from a country, the greater must be its wealth and prosperity. It therefore, becomes necessary to seek out and to adopt some leading article, suited to the soil and climate, valuable in itself, easy of production, and proper alike for home and foreign consumption. Your committee are grateful, that while this State is possessed of a mild and salubrious climate, and a fertile soil, it is surrounded by navigable waters, giving it immense commercial advantages; that it contains within itself almost unlimited sources of agricultural wealth; that there are very many of the boasted productions of foreign climes, which the hardy and virtuous yeomanry of Ohio may, by industry, produce from her genial soil; and they trust that the time is rapidly advancing, when their favorite State will no longer depend upon foreign countries for many of these commodities. They have, however, looked in vain through this State, for any great leading staple of production, other than those which are intended for food; and in the production of these articles, they cannot observe that Ohio possesses advantages, either of soil or climate, which will, in future time, render her eminently superior to her neighbors; but they believe that the time has now arrived, when many of her citizens, if properly and prudently supported by the legislature, may be induced to commence operations which will permanently establish some of them within your borders. The culture of silk, and of the sugar beet, which are the sources of national wealth in other countries, it is believed, may be successfully and profitably pursued here. Our soil has been found to be peculiarly adapted to the mulberry in all its varieties; and the silk worm, wherever it has been fed among us, has always produced an article equal to the produce of other lands. We consider it as settled, that we may produce silk, in any reasonable quantities, and of good quality, without interfering with any other of the branches of domestic industry.

The labor requisite to make the crop, is of that character which has of late become least available in our country, from the rapid introduction of machinery; and we are satisfied, that it is not the least pleasing and valuable feature of this business, that it may be attended to entirely by the females, children, and infirm persons of the State, while the farmer and his able-bodied laborers are attending to their ordinary avocations; and that thus, while all are enabled to do something towards the general welfare, each one is laying up for himself a comfortable independence.

Your committee are satisfied, that this article, when produced in large quantities among us, as it must sometimes be, will always find a ready and profitable market. The consumption of silk annually, is astonishing, and without inquiring as to the enormous quantities consumed in foreign countries, we think it only necessary to state, that the importation of manufactured silk goods into this country during the year 1835, exceeded the sum of $17,800,000, while the raw silk, prepared for the manufacturer, and which was the subject of trade to our merchants, was imported to the value of $10,000,000. This amount which is annually increasing, is taken from our country either in money or in produce, and might as readily be kept at home, if we should raise and manufacture our own articles. In addition to this domestic market, Europe offers a field of no mean importance. Great Britain, Russia, and the other northern powers, from the determined inhospitality of their climates, can produce no silk. England alone, manufactures more than $30,000,000 worth of raw silk, raised in foreign countries, and it is stated on good authority, that more than 400,000 of her citizens derive their support from this source. Even France, which is, perhaps, the greatest silk producing district of the world, requires aid from foreign countries in the supply of the raw material, to an amount exceeding $5,000,000 annually.

It is found that the consumption of this valuable commodity is increasing every where, as well as in the United States, and it is stated that France, with her immense manufacturing capital and power, is unable to meet the demand of our market alone for the current year.

Your committee have been induced to inquire, whether the citizens of these western States, and of Ohio in particular, are able to compete to advantage in the markets of the eastern or Atlantic cities, with eastern agriculturists in the articles which they now raise. They are disposed to take it for granted, that the surplus productions of the west must, in time, seek a market in the east; and they look upon the construction of canals and railroads, by eastern capitalists, as a step to secure this golden prize. It is an unquestionable fact, that much of our land is more fertile than that of the east, and of consequence, that our crops are more abundant, yielding a greater return for the labor expended. But yet the articles produced are all of considerable bulk and weight; and to convey them to the east, will all the advantages of railroads and steamboats, must ever be attended with a burdensome expense, amounting almost to a prohibition of many of the most important of them. The eastern farmer, with his market at hand, can thus immediately convert his crop into money, and his inhospitable soil is, in fact, made to yield him a greater profit, although a smaller crop, than can be realized by the western farmer.

We are, however, satisfied that the farmers of this State can introduce crops, which are of themselves intrinsically valuable, small in bulk, and easy of transportation, on which the freight would be an unimportant item; and that then the farmer of Ohio, with his more fertile soil and greater crop, may compete successfully with the eastern agriculturist. In this view, they regard the culture of silk as eminently entitled to consideration; affording, as it does, a crop of great intrinsic value, and of easy conveyance. The expense of transporting flour to New-York, is one cent per pound, while the expense of conveying silk would be the same, the value of the one being diminished twelve and a half per cent. by transportation, the other one fourth per cent. in consequence of the great difference in their intrinsic value. In this view of the case, which we deem of much importance, the introduction of the silk culture is eminently worthy of consideration.

We are also of opinion, that the introduction of this crop would be further beneficial to the community, by calling into operation, within our borders, capital for manufacturing purposes, now seeking investment in other places. And that very considerable numbers of our population would thus find permanent and profitable employment.

We find that, in several States of this Union, this subject has been considered of so much importance, as to receive the favorable interposition of several legislatures; and that such aid has always resulted beneficially to those States, while it has been an incentive to those engaged in the business. Your committee, having in view the large number of petitions which are before them, and the very respectable list of signatures to these petitions, have been at a loss how to extend to this business any encouragement, except by proposing to the legislature a bill, offering to those engaging in the business, a small premium or bounty, for a limited time; and this they do the more willingly, as they are satisfied of the justice and propriety of the course, and because they find before them the example of other States, in which this system has become a fixed and determined policy. They are also induced to do so, because they find that investments in the silk culture, unlike most other kinds of agricultural business, cannot be made to yield an immediate return. Orchards must be planted, proper buildings erected, and other preliminaries attended to, necessarily requiring some few years of time before any adequate return can be anticipated, and this premium is, therefore, asked for by the petitioners, and recommended by your committee, as a small compensation to those who are willing thus to invest their means.

Buckwheat.—Let no Farmer who has ground to spare, neglect to put in a few acres of this excellent grain; while its flour commands a ready sale and good price, its straw is among the best hay that he can give to his milch cows.

Advertisements.

Engineer's Office, Wilmington and Raleigh Railroad, May, 4, 1837.

TO BRIDGE BUILDERS—Proposals will be received until the 30th June, for the erection of Bridges on the Wilmington and Raleigh Railroad, across the Neuse and Tar Rivers, Con'entnea, Swift's, Fishing and Quanky Creeks. The Bridges will be built on the plan of Town. The greatest span will not exceed 120 feet, the frames weatherboarded and capped (not roofed.) The timber will be found.

For the piers and abutments, stone can be had, at the Neuse six miles by water from the bridge site—at Tar River it is found at the crossing—at Contentnea, the Bridge will rest on wooden abutments; at Swift's Creek, the rock is situated about 3 miles by water from the bridge site—at Fishing Creek it is found within a few hundred yards of the bridge on the bank of the creek—and at Quanky the quarries are situated about three miles by land from the proposed bridge. The piers and abutments will in no instance exceed 22 feet in height. For further particulars, address the subscriber at Wilmington, North Carolina.

WALTER GWYNN, Civil Engineer.

9t—24

☞ TO RAILROAD COMPANIES.

A PERSON experienced in the construction of Locomotive Engines (many of his Manufacture being in successful operation on important Railroads in the United States) and who is likewise thoroughly acquainted with the management of such machines, and, indeed, the entire ordeal of Railroads, is desirous of obtaining the situation of General Superintendant on some Railroad, South or West.

The most satisfactory testimonials of character and capability can be produced. Communications addressed to the Editors of this Journal, stating the location of Road, &c. will meet with prompt attention.

9t—24

DRAWING INSTRUMENTS.—E. & G. W. Blunt, 154 Water-street, New-York, have received, and offer for sale, Drawing Instruments of superior quality, English, French, and German Manufacture.

They have also on hand Levels of superior quality at low prices.

☞ Orders received at this office for the above Instruments.

TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS OF GREAT BRITAIN.

The first volume of this valuable work, has just made its appearance in this country. A few copies, say *twenty-five* or *thirty* only, have been sent out, and those have nearly or quite all been disposed of at *ten dollars* each—a price, although *not* the *value* of the work, yet one, which will prevent many of our young Engineers from possessing it. In order therefore, to place it within their reach, and at a convenient price, we shall *reprint* the entire work, with ll its enagravings, *neatly done* on wood, and issue in six *parts* or *numbers*, of about 48 pages each, which can be sent to any part of the United States by mail, as issued, or put up in a volume at the close.

The price will be to subscribors *three dollars*, or *five dollars* for two copies—*always in advance*. The first number will be ready for delivery early in April—Subscriptions are solicited.

FOR SALE AT THIS OFFICE,

A Practical Treatise on Locomotive Engines, with Engravings, by the Chevalier De Pambour—150 pages large octavo—done up in paper covers so as to be sent by mail—Price \$1 50. Postage for any distance *under* 100 miles, 40 cents, and 60 cts. for any distance exceeding 100 ms.

Also—*Van de Graaff on Railroad Curves*, done up as above, to be sent by mail—Price \$1. Postage, 20 cents, or 30 cents, as above.

Also—Introduction to a view of the works of the *Thames Tunnel*—Price *fifty cents*. Postage as above, 8 cents, or 12 cts.

*** On the receipt of \$3, a copy of each of the above works will be forwarded by mail to any part of the United States.

AVERY'S ROTARY STEAM ENGINES.—AGENCY.—The subscriber offers his services to gentlemen desirous of procuring Steam Engines for driving Saw-Mills, Grain-Mills, and other Manufactories of any kind.

Engines only will be furnished, or accompanied with *Boilers* and the necessary *Machinery* for putting them in operation, and an Engineer always sent to put them up.

Information will be given at all times to those who desire it, either by letter or by exhibiting the engines in operation in this city.

Inquiries by letter should be very explicit and the answers shall be equally so.

D. K. MINOR,
30 Wall-st., New York.

TO CONTRACTORS.

JAMES RIVER AND KANAWHA CANAL.

THERE is still a large amount of mechanical work to let on the line of the James River and Kanawha Improvement, consisting of twenty locks, about one hundred culverts and several large aqueducts, which will be offered to responsible contractors at fair prices.

The locks and aqueducts are to be built of cut stone.

The work contracted for must be finished by the 1st day of July, 1838.

Persons desirous of obtaining work are requested to apply at the office of the undersigned, in the city of Richmond, before the fifteenth of May, or between the fifth and the fifteenth of July.

CHARLES ELLET, Jr.
Chief Engineer Jas. Riv. & Ka. Co.

P. S.—The valley of James River above Richmond is healthy. 16—10t

PATENT RAILROAD, SHIP AND BOAT SPIKES.

. The Troy Iron and Nail Factory keeps constantly for sale a very extensive assortment of Wrought Spikes and Nails, from 3 to 10 inches, manufactured by the subscriber's Patent Machinery, which after five years successful operation, and now almost universal use in the United States, (as well as England, where the subscriber obtained a patent,) are found superior to any ever offered in market.

Railroad Companies may be supplied with Spikes having countersink heads suitable to the holes in iron rails, to any amount and on short notice. Almost all the Railroads now in progress in the United States are fastened with Spikes made at the above named factory—for which purpose they are found invaluable, as their adhesion is more than double any common spikes made by the hammer.

. All orders directed to the Agent, Troy, N. Y., will be punctually attended to.

HENRY BURDEN, Agent.

Troy, N. Y., July, 1831.

. Spikes are kept for sale, at factory prices, by I. & J. Townsend, Albany, and the principal Iron Merchants in Albany and Troy; J. I. Brower, 222 Water street, New-York; A. M. Jones, Philadelphia; T. Janviers, Baltimore; Degrand & Smith, Boston.

P. S.—Railroad Companies would do well to forward their orders as early as practicable, as the subscriber is desirous of extending the manufacturing so as to keep pace with the daily increasing demand for his Spikes. (1J23am) H. BURDEN.

TO RAILROAD CONTRACTORS.

SEALED proposals will be received at the office of the Selma and Tennessee River Railroad Company, in the town of Selma, Alabama, for the graduation of the first forty miles of the Selma and Tennessee Railroad. Proposals for the first six miles from Selma, will be received after the first of May, and acted on by the Board on the 15th May. Proposals for the ensuing 34 miles, will be received after the 10th May, but will not be examined until the 1st of August next, when the work will be ready for contract.

The line, after the first few miles, pursuing the flat of the Mulberry Creek, occupies a region of country, having the repute of being highly healthful. It is free from ponds and swamps, and is well watered — The soil is generally in cultivation, and is dry, light and sandy, and uncommonly easy of excavation.— The entire length of the line of the Sel a and Tennessee Railroads, will be about 170 miles, passing generally through a region as favorable for health as any in the Southern Country.

Owing to the great interest at stake in the success of this enterprise, and the amount of capital already embarked in it, this work must necessarily proceed with vigor, and I invite the attention of men of industry and enterprise, both at the North and elsewhere to this undertaking, as offering in the prospect of continued employment, and the character of the soil and climate, a wide and desirable field to the contractor.

Proposals may be addressed either to the subscriber, or to General Gilbert Shearer, President of the Company.

ANDREW ALFRED DEXTER, Chief Engineer
Selma, Ala., March 20th, 1837. A 15 tf

ROACH & WARNER,

Manufacturers of OPTICAL, MATHEMATICAL AND PHILOSOPHICAL INSTRUMENTS, 293 Broadway, New York, will keep constantly on hand a large and general assortment of Instruments in their line.

Wholesale Dealers and Country Merchants supplied with SURVEYING COMPASSES, BAROMETERS, THERMOMETERS, &c. &c. of their own manufacture, warranted accurate, and at lower prices than can be had at any other establishment.

Instruments made to order and repaired. 14 ly

FRAME BRIDGES.

THE undersigned, General Agent of Col. S. H. LONG, to build Bridges, or vend the right to others to build, on his Patent Plan, would respectfully inform Railroad and Bridge Corporations, that he is prepared to make contracts to build, and furnish all materials for superstructures of the kind, in any part of the United States, (Maryland excepted.)

Bridges on the above plan are to be seen at the following localities, viz. On the main road leading from Baltimore to Washington, two miles from the former place. Across the Metawamkeag river on the Military road, in Maine. On the national road in Illinois, at sundry points. On the Baltimore and Susquehanna Railroad at three points. On the Hudson and Patterson Railroad, in two places. On the Boston and Worcester Railroad, at several points. On the Boston and Providence Railroad, at sundry points. Across the Contoocook river at Henniker, N. H. Across the Souhegan river, at Milford, N. H. Across the Connecticut river, at Haverhill, N. H. Across the Contoocook river, at Hancock, N. H. Across the Androscoggin river, at Turner Centre, Maine. Across the Kennebec river, at Waterville, Maine. Across the Genesse river, at Squakiehill, Mount Morris, New-York. Across the White River, at Hartford Vt. Across the Connecticut River, at Lebanon, N. H. Across the mouth of the Broken Straw Creek, Penn. Across the mouth of the Cataraugus Creek, N. Y. A Railroad Bridge diagonally across the Erie Canal, in the City of Rochester, N. Y. A Railroad Bridge at Upper Still Water, Orono, Maine. This Bridge is 500 feet in length; one of the spans is over 200 feet. It is probably the FIRMEST WOODEN BRIDGE ever built in America.

Notwithstanding his present engagements to build between twenty and thirty Railroad Bridges, and several common bridges, several of which are now in progress of construction, the subscriber will promptly attend to business of the kind to much greater extent and on liberal terms. MOSES LONG.

Rohester, Jan. 13th, 1837. 4—y

ALBANY EAGLE AIR FURNACE AND MACHINE SHOP.

WILLIAM V. MANY manufactures to order, IRON CASTINGS for Gearing Mills and Factories of every description.

ALSO—Steam Engines and Railroad Castings of every description.

The collection of Patterns for Machinery, is not equalled in the United States. 9—1y

NEW ARRANGEMENT.

ROPES FOR INCLINED PLANES OF RAILROADS.

WE the subscribers having formed a co-partnership under the style and firm of Folger & Coleman, for the manufacturing and selling of Ropes for inclined planes of railroads, and for other uses, offer to supply ropes for inclined planes, of any length required without splice, at short notice, the manufacturing of cordage, heretofore carried on by S. S. Durfee & Co., will be done by the new firm, the same superintendant and machinery are employed by the new firm that were employed by S. S. Durfee & Co. All orders will be promptly attended to, and ropes will be shipped to any port in the United States.

12th month, 12th, 1836. Hudson, Columbia County State of New-York.

ROBT. C. FOLGER,
GEORGE COLEMAN,

33—tf.

AMES' CELEBRATED SHOVELS, SPADES, &c.

300 dozens Ames' superior back-strap Shovels
150 do do do plain do
150 do do do caststeel Shovels & Spades
150 do do Gold-mining Shovels
100 do do plated Spades
50 do do socket Shovels and Spades.

Together with Pick Axes, Churn Drills, and Crow Bars (steel pointed,) manufactured from Salisbury refined iron—for sale by the manufacturing agents,

WITHERELL, AMES & CO.
No. 2 Liberty street, New-York

BACKUS, AMES & CO.
No. 8 State street, Albany

N. B.—Also furnished to order, Shapes of every description, made from Salsbury refined Iron v4—tf

STEPHENSON,

Builder of a superior style of Passenger Cars for Railroads.

No. 264 Elizabeth street, near Bleeckerstreet, New-York.

RAILROAD COMPANIES would do well to examine these Cars; a specimen of which may be seen on that part of the New-York and Harlaem Railroad now in operation J25tf

TO RAILROAD CONTRACTORS.

PROPOSALS will be received, at the office of the Hiwassee Railroad Com., in the town of ATHENS, TENNESSEE, until sunset, of Monday, June 12th, 1837; for the grading, masonry and bridges, on that portion of the HIWASSEE RAILROAD, which lies between the River Tennessee and Hiwassee. A distance of 40 miles.

The quantity of excavation will be about one million of cubic yards.

The line will be staked out; and, together with drainings and specifications of the work, will be ready for the inspection of contractors, on and after the 1st day of June.

JOHN C. TRAUTWINE,
Engineer in Chief Hiwassee Railroad.
16—6t.

RAILWAY IRON, LOCOMOTIVES, &c.

THE subscribers offer the following articles for sale.

Railway Iron, flat bars, with countersunk holes and mitred joints,

						lbs.	
350 tons	2½ by	⅝,	15 ft in length,	weighing		4 68/100	per ft.
280 "	2 "	⅝,	"	"	"	3 50/100	"
70 "	1½ "	½,	"	"	"	2½	"
80 "	1¼ "	⅜,	"	"	"	1 25/100	"
90 "	1 "	½,	"	"	"	⅞	"

with Spikes and Splicing Plates adapted thereto. To be sold free of duty to State governments or incorporated companies.

Orders for Pennsylvania Boiler Iron executed.

Rail Road Car and Locomotive Engine Tires, wrought and turned or unturned, ready to be fitted on the wheels, viz. 30, 33, 36, 42, 44, 54, and 60 inches diameter.

E. V. Patent Chain Cable Bolts for Railway Car axles, in lengths of 12 feet 6 inches, to 13 feet 2½, 2¾, 3, 3¼, 3½, 3¾, and 3⅞ inches diameter.

Chains for Inclined Planes, short and stay links, manufactured from the E. V. Cable Bolts, and proved at the greatest strain.

India Rubber Rope for Inclined Planes, made from New Zealand flax.

Also Patent Hemp Cordage for Inclined Planes, and Canal Towing Lines.

Patent Felt for placing between the iron chair and stone block of Edge Railways.

Every description of Railway Iron, as well as Locomotive Engines, imported at the shortest notice, by the agency of one of our partners, who resides in England for this purpose.

A highly respectable American Engineer, resides in England for the purpose of inspecting all Locomotives, Machinery, Railway Iron &c. ordered through us.

A. & G. RALSTON & CO.
28 tf Philadelphia, No. 4, South Front st.

ARCHIMEDES WORKS.

(100 North Moor street, N. Y.)

NEW-YORK, February 12th, 1836.

THE undersigned begs leave to inform the proprietors of Railroads that they are prepared to furnish all kinds of Machinery for Railroads, Locomotive Engines of any size, Car Wheels, such as are now in successful operation on the Camden and Amboy Railroad, none of which have failed—Castings of all kinds, Wheels, Axles, and Boxes, furnished at shortest notice.

4—ytf H. R. DUNHAM & CO.

MACHINE WORKS OF ROGERS, KETCHUM AND GROSVENOR, Paterson, New-Jersey.

The undersigned receive orders for the following articles, manufactured by them, of the most superior description in every particular. Their works being extensive, and the number of hands employed being large, they are enabled to execute both large and small orders with promptness and despatch.

RAILROAD WORK.

Locomotive Steam-Engines and Tenders; Driving and other Locomotive Wheels, Axles, Springs and Flange Tires; Car Wheels of cast iron, from a variety of patterns, and Chills; Car Wheels of cast iron, with wrought Tires; Axles of best American refined iron, Springs; Boxes and Bolts for Cars.

COTTON WOOL AND FLAX MACHINERY,

Of all descriptions and of the most improved Patterns, Style and Workmanship.

Mill Geering and Millwright work generally; Hydraulic and other Presses; Press Screws; Callenders; Lathes and Tools of all kinds; Iron and Brass Castings of all descriptions.

ROGERS, KETCHUM & GROSVENOR
Patterson, New-Jersey, or 60 Wall street, N. Y. 51tf